IEA - Data Enhancement Project

Questionnaire printing

Study: SC2

Population: 3

Instrument: STX_3

Student Achievement Test Science general (3X) Population 3

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1 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

P3X01

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2 Why is a day on the planet Mars slightly longer than a day on Earth?

A The distance from the Sun to Mars is greater than the distance from the Sun to Earth.
B It takes longer for Mars to complete one revolution around the Sun.
C It takes longer for Mars to complete one turn on its axis.
D Mars has two moons but Earth has only one.
E Mars has a smaller diameter than the Earth.

P3X02

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3 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.

P3X03

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4 Similar fragments of a certain plant tissue were placed in 1%, 9% and 15% sugar solutions respectively. When viewed under the microscope after they had reached equilibrium with the bathing solution, single cells appeared as shown in the diagrams for the three solutions.

[Three cells]

The differences shown in the three drawings are due to properties of the cell and its surrounding solution.

Suppose the same experiment is carried out using a salt solution instead of a sugar solution. What will fill the space between the cell wall and the protoplast in diagram 3?

A water
B air
C salt solution
D ectoplasm
E cell sap

P3X04

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5 What initially determines whether a human baby is going to be a male or a female?

A The DNA in the sperm.
B The DNA in the egg.
C The RNA in the sperm.
D The RNA in the egg.
E The DNA and RNA in both sperm and egg.

P3X05

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6 Two alternative colour characteristics in mice are "hooded" and "white". When homozygous parents of both colours are crossed all the offspring are hooded. If these F1 hooded rats are mated together and produce litters totalling 50 rats, which one of the following proportions is most likely?

A 50 hooded : none white
B 50 white : none hooded
C 38 white : 12 hooded
D 24 white : 26 hooded
E 10 white : 40 hooded

P3X06

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7 In slightly diluted sea water, the small marine worm Gunda swells when deprived of oxygen and shrinks again when oxygen is supplied. What is the most likely explanation?

A Lack of oxygen results in an incomplete oxidation of waste products.
B The lack of oxygen increases water absorption.
C Excess water is poisonous to the organism.
D When less oxygen is available, there is not enough energy to oppose entry of water by means of osmosis.
E An increase of surface area gives a better means of oxygen absorption.

P3X07

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8 In an experiment with a certain plant, the photosynthetic rate per unit of leaf area was measured at different light intensities. The experiment was repeated at three different temperatures, 5øC, 15øC and 25øC. An adequate supply of carbon dioxide was maintained throughout the experiments. The graph shows the results.

[Graph of relative photosynthetic rate vs
light intensity (x 100 foot-candles)]

On the basis of the data given in the graph, what factor or factors determine the photosynthetic rate in light intensities more than 3,000 foot-candles?

A light intensity
B temperature
C temperature and light intensity
D water status of plant
E no factor can be ascertained from the graph

P3X08

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9 In order to obtain two crops in one growing season a farmer planted some seeds which he had harvested the previous week but the seeds failed to germinate. What can be concluded from this observation?

A The farmer did not provide the right conditions for germination.
B The seeds needed a longer period of maturation.
C The farmer had not removed inhibiting substances.
D The seeds required a period of low temperature.
E The data are inadequate for a conclusion to be reached.

P3X09

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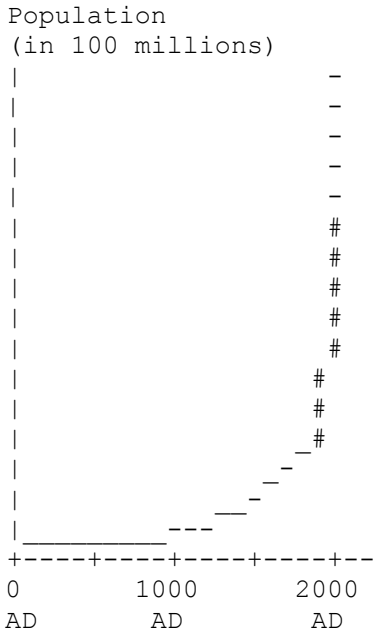
10 The graph refers to the growth of human population. The solid-line (#) section of the curve is based on actual data, while the dashed-line (-) sections are based on computer estimates.

Can the slope of the line representing actual data remain the same indefinitely?

A Yes, man will find a way to produce an infinite food supply.
B Yes, man will migrate to other planets.
C Yes, man will find other energy sources.
D No, the slopes of lines never remain the same.
E No, when the limit of food supply and other resources of the earth is reached, the population will also reach its limit.



P3X10

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11 The graph shows the solubility of two substances X and Y. A sample of 150 g of X and 75 g of Y is placed in a beaker containing 100 cm3 of water. Assume that the placing of the two substances together has no effect on how either dissolves. The mixture is filtered at 60 øC. What would the residue on the filter paper consist of?

[Picture]

A 95 g of X and 15 g of Y
B 55 g of X and 75 g of Y
C 95 g of X
D 75 g of Y
E 55 g of X

P3X11

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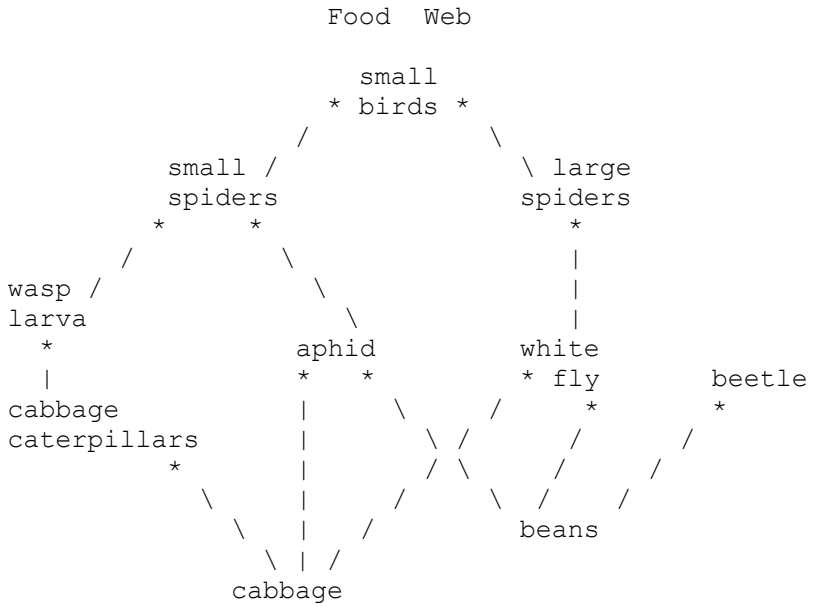
12 Below is a diagram showing a food web. A food web shows what the animals eat. Some animals eat the plants. These are then eaten by other animals who may be eaten by others. The arrows go from the food to the eater. For example: cabbage -> [-*] aphid (means aphids eat cabbages).



If all the beans were dug up and destroyed, which animal would disappear?

A large spiders
B beetles
C aphids
D whiteflies
E small birds

P3X12

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13 Copper reacts with concentrated sulphuric acid as represented by the following equation:

$$Cu + 2H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2H_2O$$

Which one of the following statements about the reaction is true?

A Copper is oxidized.
B Sulphuric acid is oxidized.
C Sulphuric acid is the reducing agent.
D Copper is reduced.
E Hydrogen is the reducing agent.

P3X13

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14 Which of the following does *not* provide evidence of evolution?

A Green plants can be arranged in order from simple to complex.
B Embryos of birds, reptiles, and mammals have gill clefts resembling those of a fish embryo.
C The ancestry of animals like the horse can be traced through the fossil record.
D The caecum is present in all mammals including man but is only functional in some.
E The individuals within a species differ considerably one from another.

P3X14

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15 An aqueous solution of sodium iodide is electrolysed with platinum electrodes. What is the main product at the cathode (negative electrode)?

A oxygen molecules
B iodine molecules
C hydrogen ions
D sodium atoms
E hydrogen molecules

P3X15

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16 Which of the following methods would you use in order to obtain copper from copper oxide?

A Heat copper oxide with silver.
B Heat copper oxide with sulphur.
C Pass hydrogen over hot copper oxide.
D Heat copper oxide with dilute hydrochloric acid.
E Pass steam over hot copper oxide.

P3X16

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17 Which one of the following elements forms an oxide which turns red litmus paper blue when added to water?

A phosphorus
B carbon
C iron
D sulphur
E calcium

P3X17

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18 Which of the following would be described best as an oxide could only be *basic*?

A Al_2O_3

B CO

C P_2O_5

D NO_2

E CaO

P3X18

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19 For which one of the following substances is the term predominantly covalent correctly used to describe all the strong bonds between the atoms?

A magnesium oxide
B copper sulphate
C sodium chloride
D carbon disulphide
E nickel

P3X19

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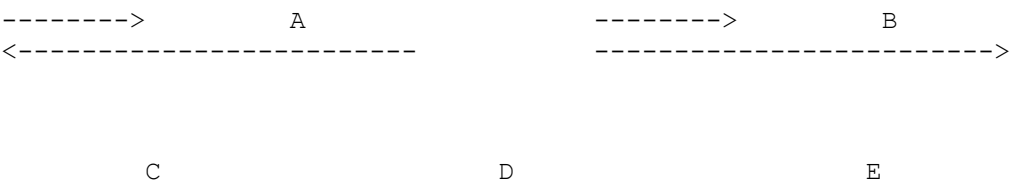
20 Which two vectors shown have the resultant represented by ----------> ?



C D E

[C-E Sets with two diagonal vectors /\ ]

P3X20

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21 The following procedure was used to see how temperature affects the solubility of a salt in water.

An excess of the salt was shaken with water at a known temperature until no more appeared to dissolve. A clear solution was then obtained by filtration. A portion of the solution was weighed. The water was evaporated from this portion, and the dry salt was weighed. The procedure was repeated at the same temperature as a check before repeating the procedure at other temperatures.

Which of the following is likely to cause the greatest error during determination of the solubility at a given temperature?

A Allowing solution temperature to change prior to filtration.
B Allowing solution temperature to change during evaporation.
C Allowing solution temperature to change during weighing.
D Not using the same size of salt crystals in the check determinations.
E Not adding the same excess of salt in the check determinations.

P3X21

22

Object mass = 10 kg

[Picture]

Some of this information may be useful:

sin 30ø = 0.50 sin 60ø = 0.87
cos 30ø = 0.87 cos 60ø = 0.50

Acceleration due to gravity g = 9.8 m.s^{-2}

An object of mass 10 kg is to be held at rest on a flat surface which is inclined at 30ø to the horizontal. Assume that there are no frictional forces between the object and the inclined surface. What is the value of the minimum force F acting parallel to the surface which is needed to prevent the object from sliding down the inclined surface?

A 10 N
B 49 N
C 85 N
D 98 N
E 196 N

P3X22

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23 The figure shows the respective positions which a small ball occupied every 1/7 second after it had been shot up vertically by a spring. Assume that the spring is compressed to the point X and then released, and that the ball leaves the spring at Y. The highest position that the ball reaches is Z. Assume that air resistance is negligible and that the acceleration due to gravity is

$9.8\ m.s^{-2}$.

What is the acceleration of the ball at the position Y?

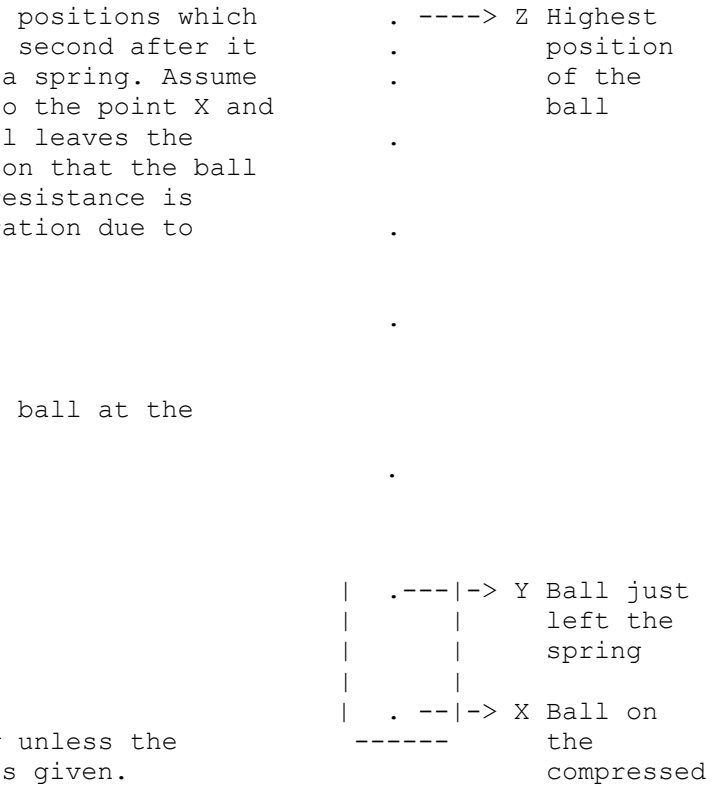
A zero

B less than $9.8\ m.s^{-2}$

C $9.8\ m.s^{-2}$

D greater than $9.8\ m.s^{-2}$

E It is impossible to say unless the height the ball rises is given.



P3X23

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24 A car with a mass of 100 kg is moving with a constant velocity of $4\ m.s^{-1}$

What is its kinetic energy?

A 200 joules
B 400 joules
C 800 joules
D 1600 joules
E 20000 joules

P3X24

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25 In an imaginary situation, a 1 kg block of ice at 0 øC is dropped from such a height that all of it is melted by the heat generated on impact with the ground. From what height would a 25 kg block of ice have to be dropped to melt completely? Assume that in both cases all of the heat produced is absorbed by the ice?

A 1/5 as high
B 1/25 as high
C the same height
D 5 times as high
E 25 times as high

P3X25

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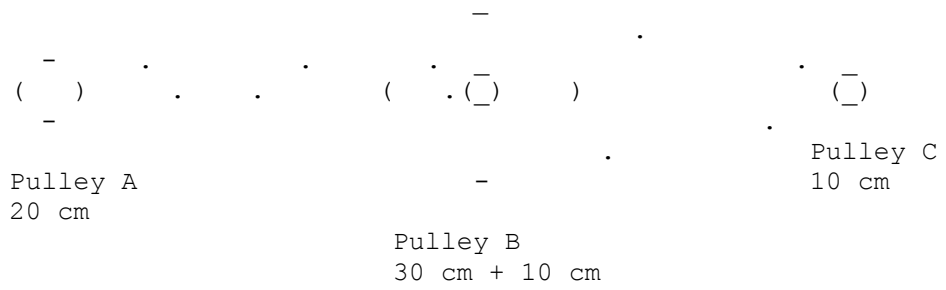
26 The diagram below shows a system of pulley wheels linked by belts. Pulley A has a diameter of 20 cm. Pulley B consists of a large pulley of diameter 30 cm and a small pulley of 10 cm fixed together. Pulley C has a diameter of 10 cm. If Pulley A is turned through one complete revolution, how many revolutions are made by Pulley C?



A 5
B 6
C 12
D 13
E 36

P3X26

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27 A sensitive mercury-in-glass thermometer registering room temperature is immersed in boiling water. The mercury level first drops slightly and then rises. Why does the drop occur?

A The specific heat of glass is greater than that of mercury.
B The coefficient of expansion is greater for glass than for mercury.
C The glass expands before the mercury does.
D At room temperature, mercury has a negative coefficient of expansion like that of water from 0 øC to 4 øC.
E The surface tension of mercury increases with temperature.

P3X27

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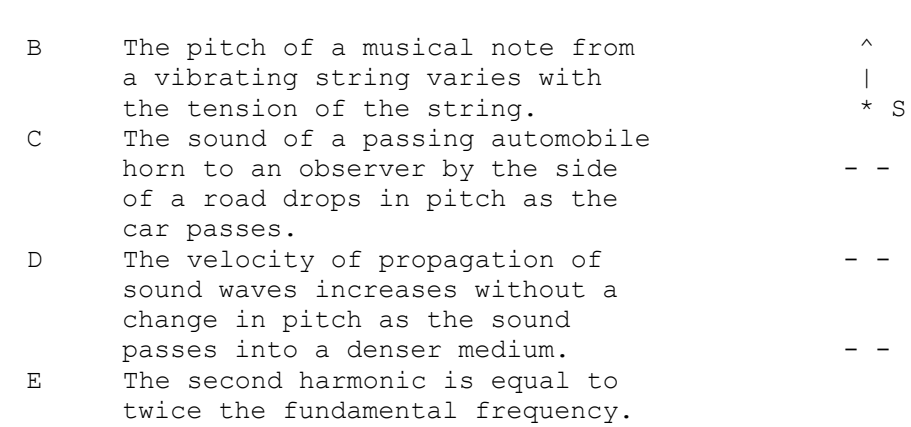
28 The sketch shows the pattern of circular waves produced by a moving source S in a tank of water. Sound can be described as a wave motion and that the pitch of a particular sound becomes higher with an increase in frequency. Which of the following phenomena might be predicted from this pattern?



A The intensity of sound from a moving source varies inversely as the square of the distance from the source.

B The pitch of a musical note from a vibrating string varies with the tension of the string.

C The sound of a passing automobile horn to an observer by the side of a road drops in pitch as the car passes.

D The velocity of propagation of sound waves increases without a change in pitch as the sound passes into a denser medium.

E The second harmonic is equal to twice the fundamental frequency.

P3X28

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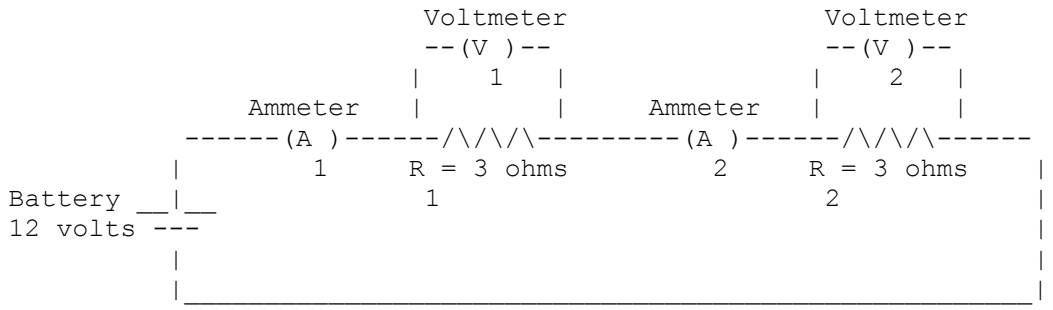
29 This question is based on the circuit represented by the diagram below.



Which one of the following sets of results would be observed?

Set	Ammeter A 1	Voltmeter V 1	Ammeter A 2	Voltmeter V 2
A	1 amp	6 volts	1 amp	6 volts
B	1 amp	12 volts	1 amp	12 volts
C	1 amp	6 volts	2 amps	12 volts
D	2 amps	6 volts	2 amps	6 volts
E	2 amps	12 volts	2 amps	12 volts

P3X29

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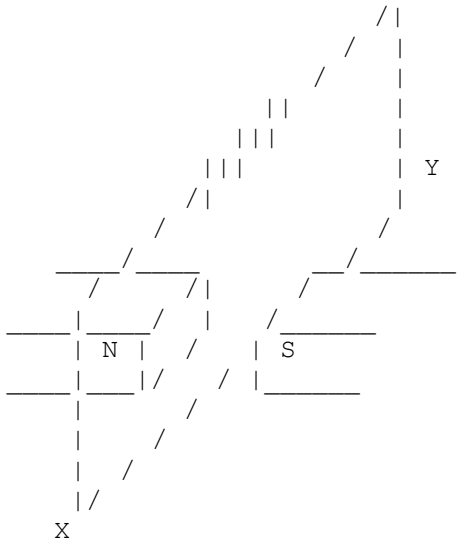
30 A wire with an electric current passing through it is placed in a magnetic field as shown in the diagram.



In which direction will the wire move?

A towards the North pole
B towards the South pole
C vertically up
D vertically down
E in the direction of point Y

P3X30
