IEA - Data Enhancement Project

Questionnaire printing

Study: SC2

Population: 3

Instrument: STM_3

Student Achievement Test Science core (3M) Population 3

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1 The following table contains some data about different planets.

Planet	Distance from the Sun	Time for one trip around the Sun
Mercury	58 million kilometres	88 days
Venus	108 million kilometres	225 days
Earth	150 million kilometres	1 year
Jupiter	780 million kilometres	12 years
Uranus	2,870 million kilometres	84 years
Neptune	4,500 million kilometres	165 years

Saturn in not in the table. It is about 1,430 million kilometres from the Sun. About how long will it take Saturn to make one round trip of the Sun?

A 300 days
B 10 years
C 30 years
D 100 years
E 500 years

P3M01

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2 Fossils very similar in shape to marine shellfish which live in oceans today have been found in the rocks of high mountains. What is the most likely explanation of this?

A The particular marine shellfish can live in the sea or on land.
B Marine forms once had organs that enabled them to breathe atmospheric air.
C The rocks in which the fossils were found were formed under the sea.
D Marine forms, in certain cases, migrate on to the land.
E Marine forms have evolved from land forms.

P3M02

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3 Here is a table of data about some stars.

Star	Relative order of brightness	Distance from Earth (Light Years)	Approximate surface temperature (øC)	Colour
Sirius	1	8.8	10,000	White
Canopus	2	98	10,000	White
Arcturus	3	36	4,000	Reddish
Vega	4	62	10,000	White
Aldeberan	5	52	4,000	Reddish

From this data what two proporties would seem most closely related?

A order of brightness and colour
B order of brightness and distance from Earth
C distance from Earth and colour
D order of brightness and surface temperature
E colour and surface temperature

P3M03

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4 Two given elements combine to form a poisonous compound. Which of the following conclusions about the properties of these two elements can be drawn from this information?

A Both elements are certainly poisonous.
B At least one element is certainly poisonous.
C One element is poisonous, the other is not.
D Neither element is poisonous.
E Neither element need be poisonous.

P3M04

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5 The diagram below shows a mountain. The prevailing wind direction and average air temperatures at different elevations on both sides of the mountain are indicated.

[Picture of mountain]

Which feature is probably located at the base of the mountain on the leeward side (location X)?

A a dry region
B a jungle
C a glacier
D a large lake
E a rain forest

P3M05

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6 When 2 g (grams) of zinc and 1 g of sulphur are heated together, practically no zinc or sulphur remains after the compound zinc sulphide is formed. What happens if 2 g zinc are heated with 2 g of sulphur?

A Zinc sulphide containing approximately twice as much sulphur is formed.
B Approximately 1 g of sulphur will be left over.
C Approximately 1 g of zinc will be left over.
D Approximately 1 g of each will be left over.
E No reaction will occur.

P3M06

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7 The diagram below shows an example of interdependence among aquatic organisms. During the day the organisms either use up or give off (a) or (b) as shown by the arrows.

[Picture of aquatic organisms: a floating water plant, a fish, small water animals and a water plant with roots]

Choose the right answer for (a) and (b) from the alternatives given.

A (a) is oxygen and (b) is carbon dioxide.
B (a) is oxygen and (b) is carbohydrate.
C (a) is nitrogen and (b) is carbon dioxide.
D (a) is carbon dioxide and (b) is oxygen.
E (a) is carbon dioxide and (b) is carbohydrate.

P3M07

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8 Which of the cells shown below would commonly be found in the human nervous system?

[5 pictures of cells.]

P3M08

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9 All of the following are aspects of the reproductive process. Which one of them must occur before we can *be certain* that fertilization has taken place?

A A male organism must find a mate.
B Reproductive organs must be produced.
C The nucleus of a male gamete must fuse with that of a female gamete.
D A spermatozoon must reach an egg cell.
E A female gamete must provide a store of food for the embryo.

P3M09

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10 Animals take in oxygen and give out carbon dioxide. Ordinary air contains very little carbon dioxide.

[Picture of apparatus as first set up and a picture of apparatus after 5 minutes.]

Which of the following can be measured with the above apparatus?

A The rate of movement of the animal.
B The amount of heat produced by the animal.
C The rate of respiration of the animal.
D The effect of carbon dioxide on the animal.
E The amount of carbon dioxide absorbed by the animal.

P3M10

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11 The male insects in a population are treated to prevent sperm production. Would this reduce this insect population?

A No, because the females would still lay eggs.
B No, because the insects would still mate.
C No, because it would not change the offspring mutation rate.
D Yes, because it would sharply decrease the reproduction rate.
E Yes, because the males would die.

P3M11

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12 This question refers to the following diagram of apparatus used to show that an animal gives out carbon dioxide in respiration.

[Picture of apparatus with 4 parts.]

Part 1 contains a substance which removes carbon dioxide from the air passing through it. Parts 2 and 4 both contain a liquid which changes in appearance when carbon dioxide passes through it.

Of the following kinds of containers for the animal which one would give the quickest result?

A a small container
B a large container
C a container in bright light
D a container covered with a dark cloth
E a container in which the air is kept moist by means of wet cotton wool

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P3M12

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13 Why is it that your body temperature does not fall even though you lose heat continually?

A The blood distributes heat round the body.
B Respiration results in the liberation of heat.
C Heat is constantly being absorbed from the Sun.
D Hot meals are eaten regularly.
E Warm clothes are good insulators.

P3M13

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14 Several different plants parts were placed in sealed containers of equal volume. The amounts of CO2 (carbon dioxide) used by the plant parts under different conditions were measured and recorded.

Container	Plant	Plant part	Volume of plant part (cm3)	Colour of light	Temp. (øC)	Time elapsed (days)	CO2 used (cm3)
1	Myrtle	Leaf	100	Red	15	2	150
2	Myrtle	Leaf	100	Red	27	2	200
3	Myrtle	Stem	100	Blue	21	2	50
4	Oak	Root	100	Blue	27	3	0
5	Oak	Leaf	100	Orange	27	2	100
6	Oak	Leaf	100	Orange	27	3	150

Assume that all other experimental conditions were identical in all six containers.

On the basis of the data in the table, one could properly compare the amount of CO2 used in one day by

A myrtle leaves at 15 øC and at 27 øC.
B myrtle stems and myrtle leaves.
C myrtle leaves in red light and in orange light.
D oak leaves in orange light and in blue light.
E oak leaves at 15 øC and at 27 øC.

P3M14

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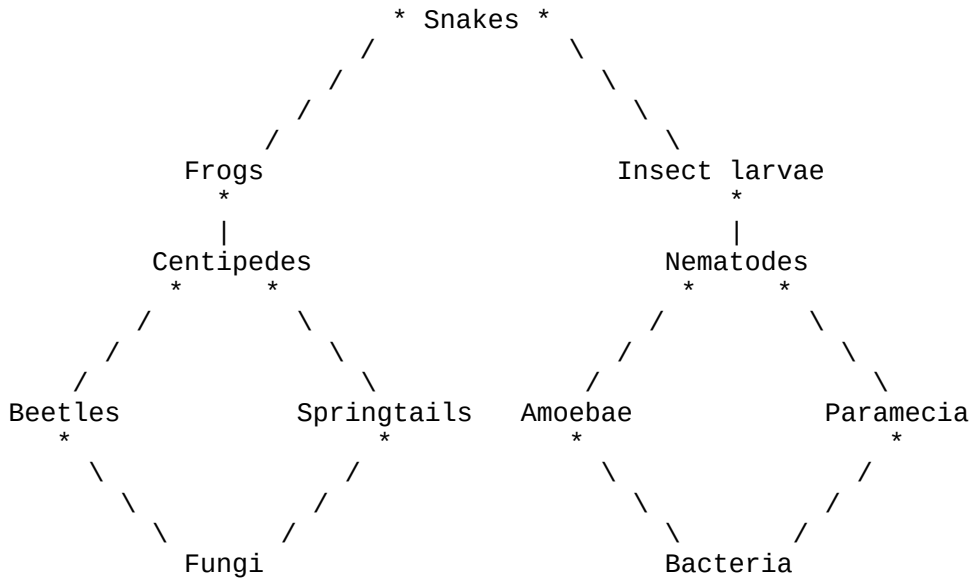
15 The following illustrates a food web.



If all the snakes were removed, which one of the following changes would probably occur in the next two years?

A The number of nematodes would increase.
B The number of frogs would decrease.
C The number of insect larvae would decrease.
D The number of centipedes would decrease.
E There would be no changes.

P3M15

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16 When alcohol is burned in air, water is formed. Another product of the combustion is a gas which turns lime water cloudy. Consider the following three statements with regard to these two facts.

I Carbon is constituent element of alcohol.
II Hydrogen is a constituent element of alcohol.
III Oxygen is a constituent element of alcohol.

Which statement or combination of these statements can be deduced from the two facts given?

A I and II
B I, II and III
C I and III
D II and III
E I only

P3M16

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17 Zinc strips are inserted into each of four beakers containing four different liquids. Each beaker is identified by a single Roman numeral.

The following observations were made.

Beaker	Initial Observation	Conductivity before zinc is added
I	no visible reaction	very poor
II	bubbles of a colourless gas form on the zinc strip	good
III	bubbles of reddish-brown gas form on the zinc strip	good
IV	no visible reaction	very good

On the basis of the evidence given which one of the following is the most reasonable inference?

A Beakers I and IV contain aqueous solutions of strong acids.
B Beaker II could contain an aqueous acid.
C Beaker III could not contain an aqueous acid.
D Beaker III must contain sulphuric acid, H_2SO_4.
E Beakers I and IV contain alkaline solutions.

P3M17

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18 A hydrocarbon contains only carbon and hydrogen atoms in the ratio 1:2 and has a molecular weight of about 28. Which of the following could probably be the molecular formula of the compound?

(Atomic masses: H = 1, C = 12, N = 14)

A CH_2

B CHN_2

C C_2H_4

D C_3H_6N

E C_4H_8

P3M18

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19 Which of the following particles are gained, lost or shared during chemical changes?

A electrons furthest from the nucleus of the atom
B electrons closest to the nucleus of the atom
C electrons from the nucleus of the atom
D protons from the nucleus of the atom
E neutrons from the nucleus of the atom

P3M19

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20 Flour is a fine powder obtained by grinding wheat or other cereal grains. A pile of grain burns only very slowly whereas flour dust suspended in air is explosive. Which of the following is the best explanation of this?

A The heat produced when small particles burn is greater than the heat produced by the burning of large particles of the same substance.
B Grinding the grain changes its chemical composition.
C For the same quantity of the material, small particles have a greater surface area in contact with air than large particles.
D Small particles possess more energy than large particles.
E The flour burns completely whereas the pile of grain does not.

P3M20

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21 When 16 g of dilute sulphuric acid is poured onto 3 g of zinc in an open test tube, hydrogen gas was generated. What is the weight of the contents of the test tube after the reaction is completed?

A slightly more than 19 g
B slightly less than 19 g
C equal to 19 g
D slightly less than 16 g
E equal to 16 g

P3M21

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22 The following results are from experiments which were made to find how long it took for newborn babies of different mammals to double in weight.

Mammal	Time in days to double the weight of the newborn baby	Percentage protein in the milk of the mother
human	180	1.6
horse	60	2.0
cow	47	3 5
pig	18	5.9
sheep	10	6.5
dog	8	7.1
rabbit	6	10.4

What do the results of these experiments suggest?

A The larger the mammal, the greater the protein concentration in the milk.
B The smaller the mammal, the greater the protein concentration in the milk.
C The greater the protein concentration in the mammal's milk the slower the newborn baby will double its weight.
D The greater the protein concentration in the mammal's milk the faster the newborn baby will double its weight.
E There appears to be no relationship between protein concentration in mammal's milk and time taken for a newborn baby to double its birth weight.

P3M22

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23 A steel ball rolls down an inclined plane. Which of the graphs below best represents the relationship between the distance travelled (s) and the time (t)? (Assume retarding forces are negligible.)

[3 straight lines and 2 curves of (s) versus (t)]

P3M23

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24 An iron container is weighed after the air in it has been pumped out (evacuated). Then it is filled with hydrogen gas and weighed again.

[Picture of an iron container.]

What is the weight of the container full of hydrogen compared to the weight of the evacuated container?

A less
B greater
C the same
D greater or less depending on the volume of the gas in the container
E greater or less depending on the temperature of the gas in the container

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P3M24

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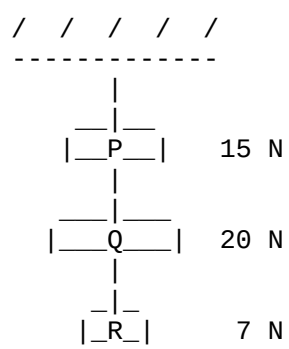
25 The objects P, Q and R of weight 15 N (newtons), 20 N and 7 N, are hung with a light thread as shown in the figure.



What is the tension in the thread between P and Q?

A 42 N
B 35 N
C 27 N
D 15 N
E 7 N

P3M25

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26 When a small volume of water is boiled, a large volume of steam is produced. Why?

A The molecules are further apart in steam than water.
B Water molecules expand when heated and make the molecules bigger than the water molecules.
C The change from water to steam causes the number of molecules to increase.
D Atmospheric pressure works more on water molecules than on steam molecules.
E Water molecules repel each other when heated.

P3M26

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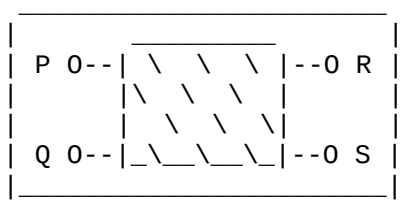
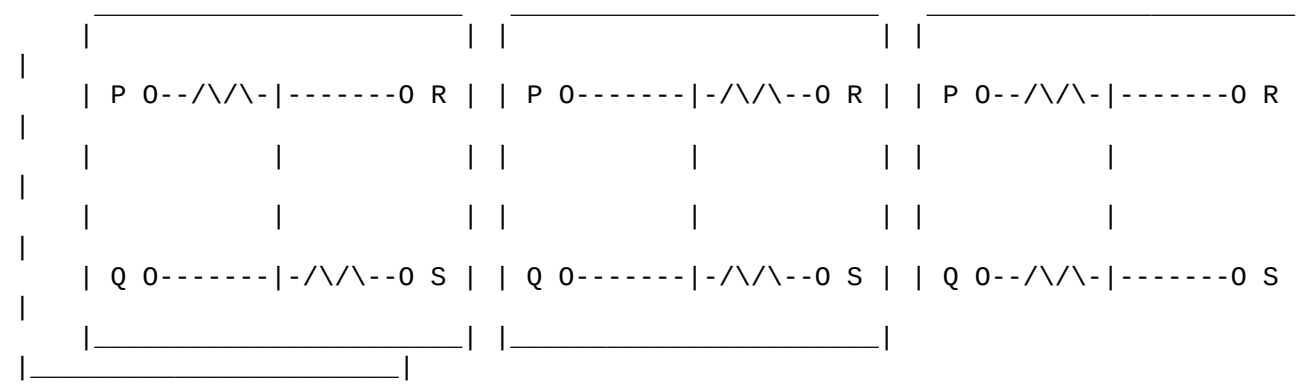
27 The figure shows a box with four terminals: P, Q, R and S.
The following observations were made.

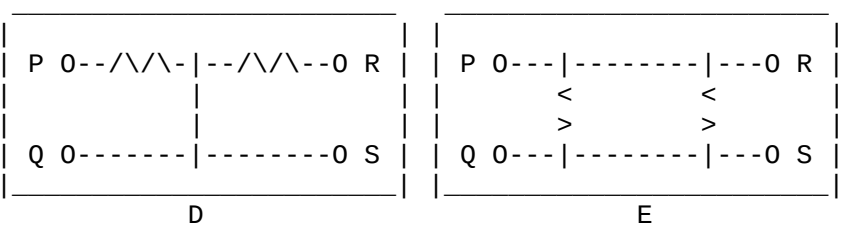
1 There is a certain amount of resistance between P and Q.
2 Resistance between P and R is twice that between P and Q.
3 There is not any appreciable resistance between Q and S.



Which of the following circuits is most likely to be within the box?
Assume that the resistances shown are equal.



A



B C

P3M27

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28 Using the apparatus shown in the figure below, 100 g (grams) of water at 20 øC (degrees Celsius) was poured into the outer container P and its temperature read at intervals from thermometer 2. At the same time 100 g of water at 80 øC was poured into the inner container Q and its temperature read at intervals from thermometer 1.

Which of the following graphs best represents the changes in the temperatures of the water in the two containers?

[1 picture of apparatus and 5 pictures of graphs]

P3M28

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29 X, Y and Z represent three lamps in a circuit, which also includes a battery and a switch S. When the switch is open X fails to light while Y and Z do.

Which of the following circuits is it?

[Picture of five circuits]

P3M29

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30 A radioactive element has a half life of 6 days. What fraction of the original element remains after 12 days?

A none
B 1/36
C 1/12
D 1/4
E 1/2

P3M30
