GENIUS CEREBRUM
THE INTELLECTUALS

GC INTERNATIONAL STEM OLYMPIAD - LEVEL THREE SAMPLE PAPER

Question 1

John has diabetes.

Which of the following should he be careful about eating or drinking?

A. beef

B. eggs

C. milk

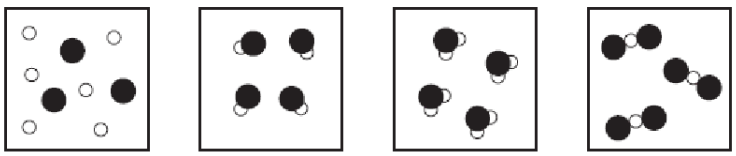
D. fruit juice

Key: D

Question 2

In the diagrams below, hydrogen atoms are represented by white circles, and oxygen atoms are represented by black circles.

Which of the diagrams best represents water?

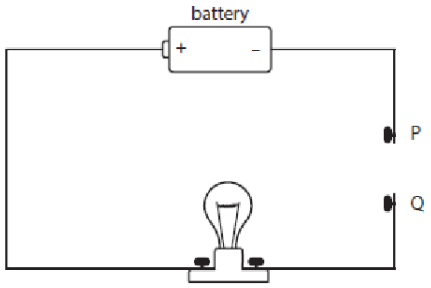


A. B. C. D.

Key: C

Question 3

Rods made of different materials are connected between points P and Q in the circuit diagram shown below.



Which rod would cause the bulb to light?

A. copper rod
B. wood rod
C. glass rod
D. plastic rod

Key: A

Question 4

During which chemical process is energy absorbed?

A. iron nails rusting
B. candles burning
C. vegetables rotting
D. plants photosynthesizing

Key: D

Question 5

Why can a small fire be put out by placing a heavy blanket over it?

A. This lowers the temperature.
B. This make the flames smaller.
C. This absorbs the burning substance.
D. This keeps oxygen from reaching the fire.

Key: D

Question 6

The figure shows a parachute jumper in four positions.

1. In the aircraft before the jump

2. In freefall immediately after jumping before parachute opens

3. Falling to the ground after the parachute opens

4. On the ground just after landing

In which of the positions does the force of gravity act on the jumper?

A. Position 2 only.

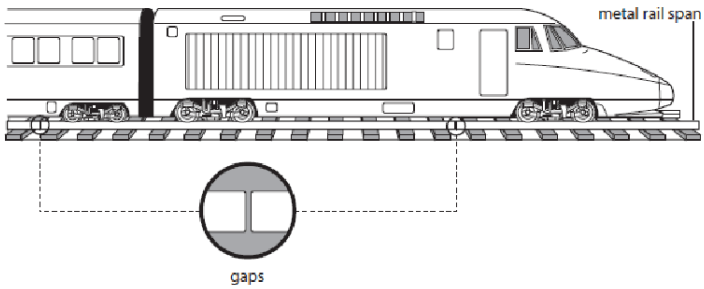
B. Positions 2 and 3 only.

C. Positions 1, 2 and 3 only.

D. Positions 1, 2, 3, and 4.

Key: D

Question 7



Which of the following best explains why some railroad tracks are laid down with gaps between the metal rail spans?

A. To allow for the metal tracks to expand on hot days.

B. To allow for the metal tracks to expand on cold days.

C. To allow for cooling of the tracks by air in the gaps.

D. To allow for vibration of the tracks due to the train.

Key: A

Question 8

A man climbed to the top of a very high mountain. While on the mountain top, he drank all the water in his plastic water bottle and then put the cover back on. When he returned to camp in the valley, he discovered that the empty bottle had collapsed.

Which of the following best explains why this happened?

A. The temperature is lower in the valley than on the mountain top.

B. The temperature is higher in the valley than on the mountain top.

C. Air pressure in the valley is lower than on the mountain top.

D. Air pressure in the valley is higher than on the mountain top.

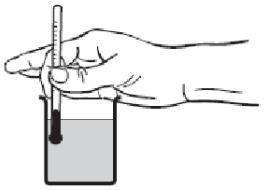
Key: D

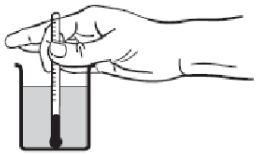
Question 9

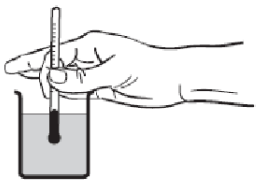
Two kinds of heat sources are usually available in the science lab; an electric hot plate and a Bunsen burner. Jack planned an investigation to test which of these sources heats water faster.

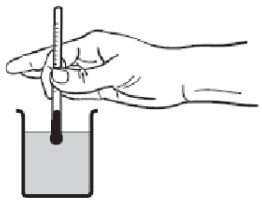
He poured 200 mL of water into each of two identical beakers and recorded the initial temperature of the water in each beaker.

A. Where should Jack place the thermometer to accurately take his readings during his investigation?

A. 

B. 

C. 

D. 

Key: C

Question 10

The pictures below show two ice blocks. Block 2 is wrapped in newspaper.

Ice Block 1 Ice Block 2 wrapped in newspaper

Which ice block will melt fi rst?

A. Block 1 B. Block 2 C. Not enough information D. Both at the same pace

Key: A

Question 11

Which of the following is the major cause of tides?

A. heating of the oceans by the Sun
B. gravitational pull of the Moon
C. earthquakes on the ocean floor
D. changes in wind direction

Key: B

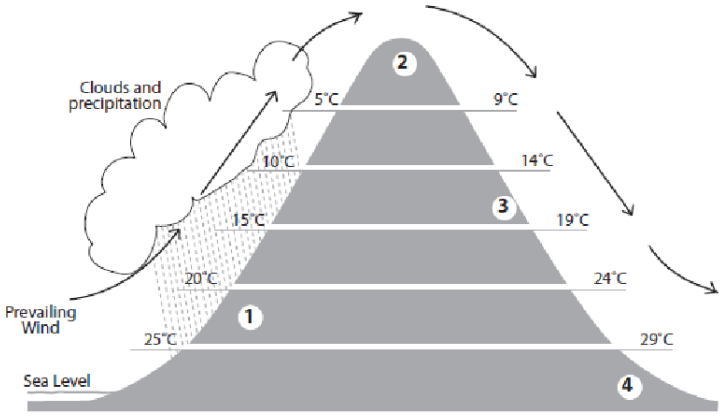
Question 12

What is the main difference between planets and moons in our solar system?

A. All planets can support life; moons cannot.
B. All planets have atmospheres; moons do not.
C. All planets orbit the Sun; all moons orbit planets.
D. All planets are larger than all moons.

Key: C

Question 13



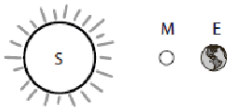
The diagram above shows the prevailing wind direction, precipitation, and average air temperatures at different elevations on both sides of a mountain. In which location are you most likely to find a jungle?

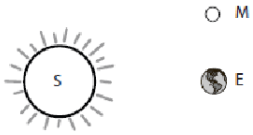
A. location 1
B. location 2
C. location 3
D. location 4

Key: A

Question 14

Which diagram shows the position of the Sun (S), moon (M), and Earth (E) during an eclipse of the moon? (Not drawn to scale)

A. 

B. 

C. 

D. 

Key: D

Question 15

Look at this table:

4^1	4^2	4^3	4^4	4^5	4^6
4	16	64	256	1,024	4,096

Use the table to express the value of $256 \times 4{,}096$ as a power of 4.

A. 4^{10}

B. 4^{16}

C. 4^{20}

D. 4^{24}

Key: A

Question 16

On one trip, Helen rode 4 km in the first 10 minutes and then 2 km in the next 5 minutes.

Which one of the following statements is correct?

A Helen's average speed was greater in the first 10 minutes than in the next 5 minutes.
B Helen's average speed was the same in the first 10 minutes and in the next 5 minutes.
C Helen's average speed was less in the first 10 minutes than in the next 5 minutes.
D It is not possible to tell anything about Helen's average speed from the information given.

Key: B

Question 17

Chris has just received her car driving licence and wants to buy her first car.

This table below shows the details of four cars she finds at a local car dealer.

Model:	Alpha	Bolte	Castel	Dezal
Year	2003	2000	2001	1999
Advertised price (zeds)	4800	4450	4250	3990
Distance travelled (kilometres)	105 000	115 000	128 000	109 000
Engine capacity (litres)	1.79	1.796	1.82	1.783

Chris wants a car that meets **all** of these conditions:

- The distance travelled is **not** higher than 120 000 kilometres.
- It was made in the year 2000 or a later year.
- The advertised price is **not** higher than 4500 zeds.

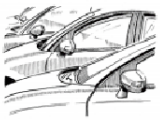
Which car meets Chris's conditions?

A Alpha
B Bolte
C Castel
D Dezal

Key: B

Question 18

Chris has just received her car driving licence and wants to buy her first car.



This table below shows the details of four cars she finds at a local car dealer.

Model:	Alpha	Bolte	Castel	Dezal
Year	2003	2000	2001	1999
Advertised price (zeds)	4800	4450	4250	3990
Distance travelled (kilometres)	105 000	115 000	128 000	109 000
Engine capacity (litres)	1.79	1.796	1.82	1.783

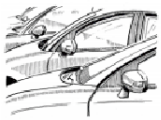
Which car's engine capacity is the smallest?

A Alpha
B Bolte
C Castel
D Dezal

Key: D

Question 19

Chris has just received her car driving licence and wants to buy her first car.



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Distance travelled (kilometres)	105 000	115 000	128 000	109 000
Engine capacity (litres)	1.79	1.796	1.82	1.783

Chris will have to pay an extra 2.5% of the advertised cost of the car as taxes. How much are the extra taxes for the Alpha?

Extra taxes in zeds..... ?

Key: 120

Question 20

Sam wanted to find three consecutive even numbers that add up to 84.
He wrote the equation $k + (k + 2) + (k + 4) = 84$.
What does the letter k represent?

(A) The least of the three even numbers

(B) The middle even number

(C) The greatest of the three even numbers

(D) The average of the three even numbers

Key: A

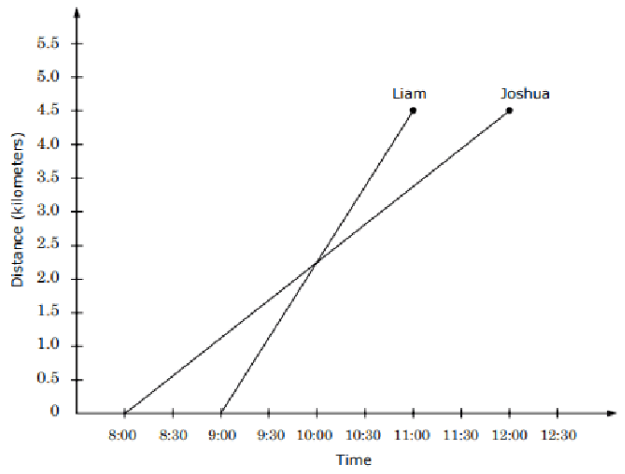
Question 21

The numbers in the sequence 7, 11, 15, 19, 23, ... increase by four. The numbers in the sequence 1, 10, 19, 28, 37, ... increase by nine. The number 19 is in both sequences. If the two sequences are continued, what is the next number that is in BOTH the first and the second sequences?

Key: 55

Question 22

The graph represents the distance and time of a hike taken by Joshua and Liam.



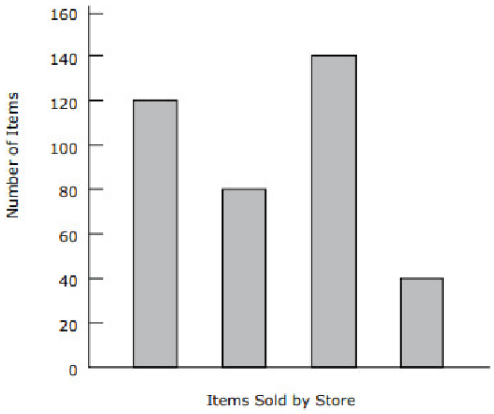
If they both started from the same place and walked in the same direction, at what time did they meet?

Ⓐ 8:00
Ⓑ 8:30
Ⓒ 9:00
Ⓓ 10:00

Key: D

Question 23

The graph shows the number of pens, pencils, rulers, and erasers sold by a store in one week.



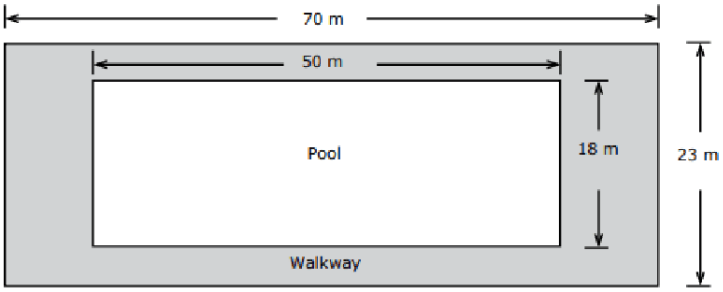
The names of the items are missing from the graph. Pens were the item most often sold, and fewer erasers than any other item were sold. More pencils than rulers were sold. How many pencils were sold?

Ⓐ 40
Ⓑ 80
Ⓒ 120
Ⓓ 140

Key: C

Question 24

A rectangular shaped swimming pool has a paved walkway around it as shown.



What is the area of the paved walkway?

Ⓐ $100\ m^2$

Ⓑ $161\ m^2$

Ⓒ $710\ m^2$

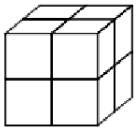
Ⓓ $1{,}610\ m^2$

Key: C

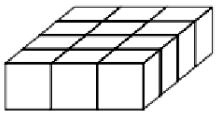
Question 25

All the small blocks are the same size. Which stack of blocks has a different volume from the others?

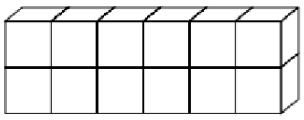
Ⓐ



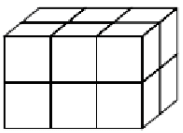
Ⓑ



Ⓒ



Ⓓ



Key: A

Question 26

Two-thirds of the people present at the beginning of a meeting are men. Nobody leaves but 10 more men and 10 more women arrive at the meeting. Which of the following statements is true?

(A) There would then be more men than women at the meeting.

(B) There would then be the same number of men as there are women at the meeting.

(C) There would then be more women than men at the meeting.

(D) From the information given, you cannot tell whether there would be more women or men.

Key: A

Question 27

Three brothers, Bob, Dan, and Mark, receive a gift of 45,000 zeds from their father. The money is shared between the brothers in proportion to the number of children each one has. Bob has 2 children, Dan has 3 children, and Mark has 4 children.

How many zeds does Mark get?

(A) 5,000

(B) 10,000

(C) 15,000

(D) 20,000

Key: D

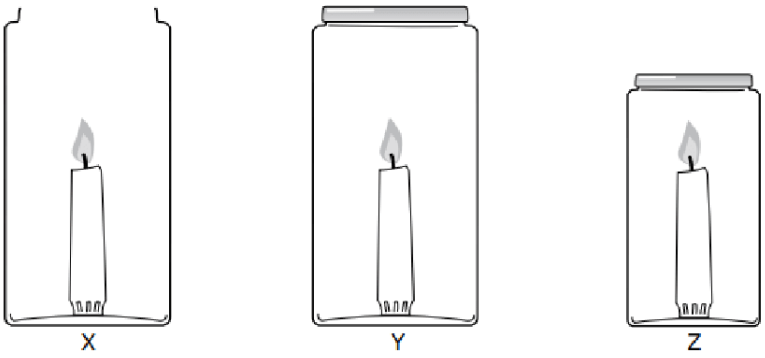
Question 28

The teachers at Parkway School plan to send 6 newsletters per year to each of the 620 families with children at the school. The newsletters each need 2 sheets of paper. The paper is sold in packs of 500 sheets.

What is the least number of packs of paper needed to print the school newsletter for the year?

Key: 15

Question 29



Three identical candles are placed in the three jars shown above and lit at the same time. Jars Y and Z are then sealed with lids, and Jar X is left open.

Which candle flame will go out first (X, Y, or Z)? _____

A. X B. Y C. Z D. Not sufficient data

Key: C

Question 30

The table shows some information about the planets Venus and Mercury.

	Average Surface Temperature (°C)	Atmospheric Composition	Mean Distance from the Sun (millions of km)	Time to Revolve Around the Sun (Number of Days)
Venus	470	Mostly Carbon Dioxide	108	225
Mercury	300	Trace amounts of gases	58	88

Which of the following best explains why the surface temperature of Venus is higher than that of Mercury?

Ⓐ There is less absorption of sunlight on Mercury because of the lack of atmospheric gases.

Ⓑ The high percentage of carbon dioxide in the atmosphere of Venus causes a greenhouse effect.

Ⓒ The longer time for Venus to revolve around the Sun allows it to absorb more heat from the Sun.

Ⓓ The Sun's rays are less direct on Mercury because it is closer to the Sun.

Key: B

Question 31

Which part of the Central Processing Unit (CPU) performs calculation and makes decisions:

A. Alternate Local Unit

B. Arithematic Logic Unit

C. Alternating Logic Unit

D. American Logic Unit

Key: B

Question 32

What is the definition of a brute force attack?

A. Repeatedly trying usernames/passwords to access a system

B. Physically threatening someone to give up personal information

C. Physically breaking into a device to hack it

D. Being a very strong hacker

Key: A

Question 33

Which one of the following statements on digital communication and social networks is FALSE?

A. The Internet offers a variety of methods and tools for people to communicate socially and professionally with each other to create online communities.

B. An advantage of IM (Instant Messaging) is that people can communicate with each other in real time and by means of their keyboards.

C. Disadvantages in the use of online communication methods are, amongst others, identity theft, spreading of viruses, spam, fraud, etc.

D. LinkedIn and Facebook are both social networking websites with the same aims and features.

Key: D

Question 34

When a computing task would take too long for any one computer to do, the use of networking will allow the use of:

A. Distributed processing.

B. To replace computers as they break down under load.

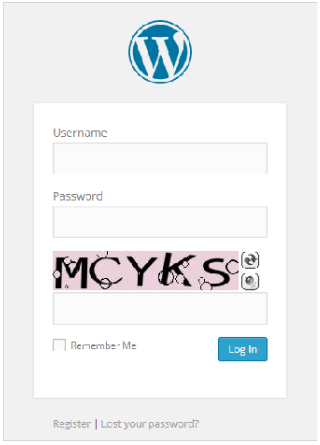
C. Will speed up Internet access.

D. None of these

Key: A

Question 35

What do you call the feature that checks you are not a robot / hacking program?



A. Captcha

B. Proover

C. Tester

D. Grabber

Key: A

Question 36

Why are thumbnails used on a page?

A. So that space on a page isn't wasted on images

B. To improve page loading times

C. To improve the look of the page

D. To speed up the page design software

Key: B

Question 37

What is a podcast?

A. A television program which you can watch after it has been broadcast

B. A live music program broadcast on digital radio

C. A digital audio file which can be downloaded from the internet

D. The discarded 'pod' or skin of a growing insect

Key: C

Question 38

The picture below shows a television satellite dish.

The satellite dish is an example of which of the following components of a television communications system?

A. decoder

B. encoder

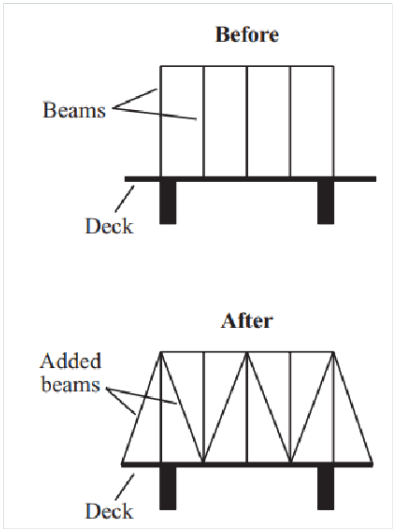
C. receiver

D. transmitter

Key: C

Question 39

The diagrams below show a section of a bridge before and after more beams were added.



What is the main reason more beams were added to the bridge?

A. to reduce shear forces

B. to increase tension forces

C. to spread tension and compression forces over a wider area

D. to create torsion forces in the vertical and diagonal directions

Key: C

Question 40

A college campus has so few parking spaces that cars are often lined up waiting to park during class hours. Which of the following describes how the college could best solve the need for more parking spaces using the universal systems model?

A. The college could build an additional parking lot, gather parking data, and then receive input from community meetings.

B. The college could limit access to parking lots during busy hours, hire security officers to help restrict parking, and then gather parking data.

C. The college could gather parking data, receive input from community meetings, build an additional parking lot, and then gather more parking data.

D. The college could hire security officers to help restrict parking, gather parking data, receive input

from community meetings, and then gather more data.

Key: C

Question 41

A crop of corn plants is genetically modified so that the plants produce a natural pesticide. People are concerned that these corn plants might transfer modified genetic material to other

plants. Which of the following is the best way to further modify the plants to prevent them from transferring their genetic materials to other plants?

A. changing the plants so they do not make pollen

B. changing the plants so they do not harm insects

C. changing the plants so they cannot produce nutrients

D. changing the plants so they cannot be easily identified

Key: A

Question 42

A student uses a keyboard on a laptop to type a message into an instant messaging program. The processor in the laptop runs the instant messaging program's commands. The laptop uses Wi-Fi to connect to the internet. Another student reads the message on a phone.

Which of the following correctly categorizes the parts of the communication system?

Ⓐ

Category	Part of System
source	Wi-Fi
encoder	phone
transmitter	keyboard
receiver	laptop's processor

Ⓑ

Category	Part of System
source	keyboard
encoder	laptop's processor
transmitter	Wi-Fi
receiver	phone

Ⓒ

Category	Part of System
source	keyboard
encoder	Wi-Fi
transmitter	laptop's processor
receiver	phone

Ⓓ

Category	Part of System
source	phone
encoder	Wi-Fi
transmitter	laptop's processor
receiver	keyboard

Key: B

Question 43

A manufacturer is considering using four different materials to construct a pan for cooking on a stove. The table shows the thermal conductivity and melting point of each material. A material with a higher thermal conductivity value conducts more thermal energy.

Material	Thermal Conductivity (W/K•m)	Melting Point (K)
aluminum	236	933
copper	400	1357
iron	68	1422
stainless steel	17	1783

Which materials should be used for the pan?

Ⓐ The manufacturer should use aluminum for the bottom of the pan and iron for the handle.

Ⓑ The manufacturer should use aluminum for the bottom of the pan and copper for the handle.

Ⓒ The manufacturer should use iron for the bottom of the pan and stainless steel for the handle.

Ⓓ The manufacturer should use copper for the bottom of the pan and stainless steel for the handle.

Key: D

Question 44

A computer touch screen allows users to enter information. Users have complained that the touch screen is too difficult to operate because the system does not indicate when a choice has been selected.

The complaints are which element of the universal systems model?

Ⓐ feedback

Ⓑ goal

Ⓒ inputs

Ⓓ processes

Key: A

Question 45

Gunpowder is the earliest known chemical explosive. It was invented in the 9th century in China. Gunpowder is a mixture of

A. Sulphur, charcoal and common sail clear

B. Saltpeter, sugar and sodium hydroxide

C. Sulphur, charcoal and potassium nitrate

D. Potassium nitrate, sugar and table salt.

Key: C

Question 46

When you type something incorrectly or miss out a character in your program what kind of error will you get

A. Checksum error

B. Hashing error

C. 404 error

D. Syntax error

Key: D

Question 47

Which of these is a videotelephony and VoIP software application, developed by Apple Inc.

A. FaceTime

B. Facebook

C. Safari

D. Skype

Key: A

Question 48

Which of the following sensors are usually present in a smartphone?

A. Accelerometer

B. GPS Sensor

C. Proximity Sensor

D. All of these

Key: D

Question 49

_____ is a technology, using which machines can mimic the behaviour of human nose, tongue or eye.

A. Immersive Reality

B. E-sensing

C. E-Immersion

D. Augmented Reality

Key: B

Question 50

A digital ledger of all the transactions ever made in a particular cryptocurrency and is repeatedly copied and saved onto thousands of computers all around the world, and it must always match each copy. As there is no master copy stored in one location, it's considered decentralized.

A. Cryptography

B. Blockchain

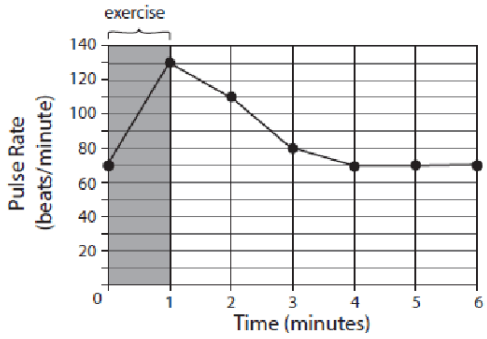
C. Bitcoin

D. Decentralized Application

Key: B

Question 51

John measures his pulse rate before he exercises. It is 70 beats per minute. He exercises for one minute and measures his pulse rate again. He then measures it every minute for several minutes. He draws a graph to show his results.



What can be concluded from his results?

A. His pulse rate increased by 50 beats per minute.

B. His pulse rate took less time to slow down than to increase.

C. His pulse rate after 4 minutes was 80 beats per minute.

D. His pulse rate returned to normal in less than 6 minutes.

Key: D

Question 52

Susie has a potted plant. She sets up an experiment that shows that water travels through a plant into the air.

Which experiment would show this?

A. Put water in a container under the pot; water will disappear from the container.

B. Cover one of the stems of the plant with a plastic bag and water the plant; drops of water will be seen in the bag.

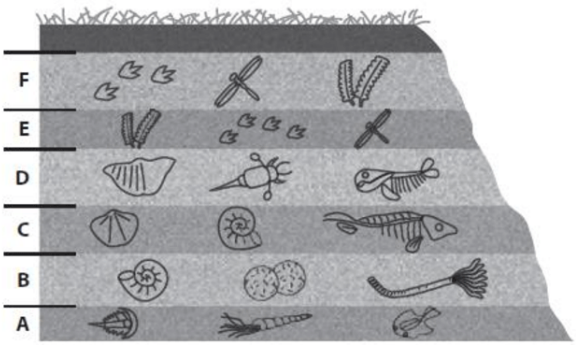
C. Place a cut stem from the plant in a plastic bag; water will be seen in the bag.

D. Place a cut stem from the plant in a glass of colored water; the plant's leaves will change color.

Key: B

Question 53

The diagram below shows geological layers of rock containing fossils. Layer F is the uppermost layer, while Layer A is the deepest layer.



Which statement about the age of the fossils is most likely correct?

A. Fossils in Layer A are the oldest, because they are located in the deepest layer.

B. Fossils in Layer C are the youngest, because they look similar to existing organisms.

C. Fossils in Layer D are older than fossils in Layer A, because the fossils in Layer D are bigger.

D. Fossils in Layer E are the same age as those in Layer F because they look the same.

Key: A

Question 54

Twins are born. One is a boy and one is a girl.

Which statement is correct about their genetic makeup?

A. The boy and the girl inherit genetic material from the father only.

B. The boy and girl inherit genetic material from the mother only.

C. The boy and girl inherit genetic material from both parents.

D. The boy inherits genetic material from the father only and the girl inherits it from the mother only.

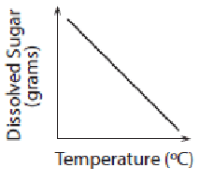
Key: C

Question 55

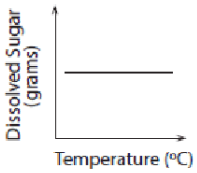
Bob did an experiment to investigate the effect of temperature on the solubility of sugar in water by measuring the amount of sugar that would dissolve in 1 liter of water at different temperatures. He then plotted his results.

Which of the following is likely to be the graph showing Bob's results?

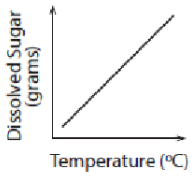
A.



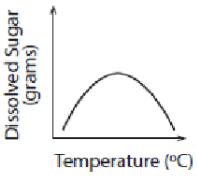
B.



C.



D.

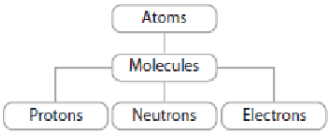


Key: C

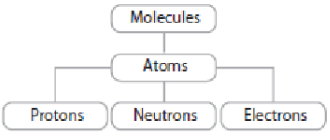
Question 56

Which of these diagrams best represents the structure of matter, starting with the more complex particles at the top and ending with the more fundamental particles at the bottom?

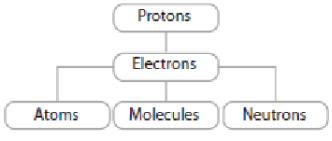
A.



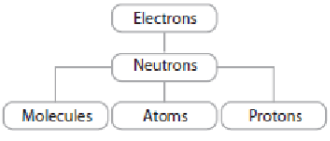
B.



C.



D.



Key: B

Question 57

Graham has twice as many books as Bob. Chan has six more books than Bob. If Bob has x books, which of the following represents the total number of books the three boys have?

(A) $3x + 6$
(B) $3x + 8$
(C) $4x + 6$
(D) $5x + 6$

Key: C

Question 58

If $L = 4$ when $K = 6$ and $M = 24$, which of the following is true?

(A) $L = \frac{M}{K}$

(B) $L = \frac{K}{M}$

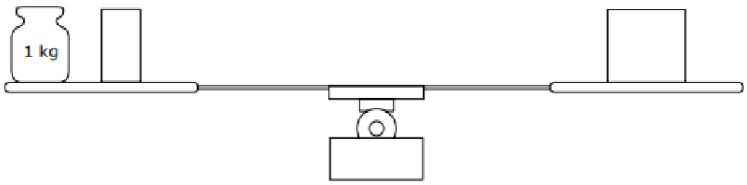
(C) $L = KM$

(D) $L = K + M$

Key: A

Question 59

The objects on the scale make it balance exactly. On the left pan there is a 1 kg weight (mass) and half a brick. On the right pan there is one brick.



What is the weight (mass) of one brick?

(A) 0.5 kg
(B) 1 kg
(C) 2 kg
(D) 3 kg

Key: C

Question 60

Matchsticks are arranged as shown in the figures.

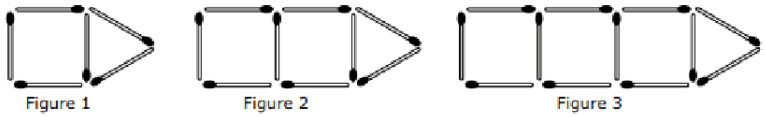


Figure 1 Figure 2 Figure 3

If the pattern is continued, how many matchsticks would be used to make Figure 10?

(A) 30

(B) 33

(C) 36

(D) 39

Key: B