GENIUS CEREBRUM
THE INTELLECTUALS

GC INTERNATIONAL SCIENCE OLYMPIAD - LEVEL FOUR SAMPLE PAPER

Question 1

Which one of the following will cause myopia?

A) When the eyeball becomes elongated.

B) When the eyeball becomes smaller.

C) When pupil becomes smaller.

D) When pupil becomes larger

Key: A

Question 2

Number(s) of alveoli in our lungs is:

A) Two

B) Four

C) Eighteen

D) More than one million

Key: D

Question 3

How will resistance of a wire change if its diameter is doubled and its length remains the same?

A) Becomes four times of initial value

B) Becomes half of initial value

C) Becomes one-fourth of initial value

D) becomes double of initial value

Key: C

Question 4

Which one of the following is not a property of magnetic field lines due to current in a circular wire?

A) The magnetic field lines are nearly circular near the wire.

B) Near the centre of the loop, the magnetic field lines are nearly parallel and straight.

C) If the number of turns in the coil increases, the strength of the magnetic field produced will increase.

D) Strength of the magnetic field will decrease if radius of the circular coil is decreased.

Key: D

Question 5

A virtual and enlarged image is formed when an object is placed at:

A) Centre of curvature in front of a concave mirror.

B) Between pole and focus in front of a concave mirror.

C) Centre of curvature in front of a convex mirror.

D) Between pole and focus in front of a convex mirror.

Key: B

Question 6

Focal length of a convex lens is 20 cm. Find the power of the lens.

A) 4 D

B) 6 D

C) 20 D

D) 5 D

Key: D

Question 7

The movement of a plant part in response to gravity is known as:

A) Geotropism

B) Chemotropism

C) Phototropism

D) Hydrotropism

Key: A

Question 8

In aerobic respiration, breaking down of pyruvate takes place in which parts of cell?

A) Cytoplasm

B) Mitochondria

C) Chloroplast

D) Nucleus

Key: B

Question 9

In which one of the following cell organelles, the process of photosynthesis occurs?

A) Mitochondria

B) Ribosomes

C) Chloroplast

D) Nucleolus

Key: C

Question 10

Which organ of the body secrets the hormone insulin?

A) Liver

B) Pancreas

C) Testes

D) Ovaries

Key: B

Question 11

If the pH value of a solution is 3, the solution is:

A) Basic

B) Acidic

C) Neutral

D) Both [a] and [b]

Key: B

Question 12

Which one of the following maintains body's posture and balance?

A) Cerebrum

B) Cerebral cortex

C) Cerebellum

D) Medulla oblongata

Key: C

Question 13

The base of a flower to which all parts of a flower are attached is known as:

A) Sepals

B) Petals

C) Receptacles

D) Stamen

Key: C

Question 14

The main power supply of a house is through a 5A fuse. How many 100 watt bulbs can be used in this house at the correct voltage?

A) 5

B) 16

C) 8

D) 11

Key: D

Question 15

Which one of the following types of reactions is the reaction between barium hydroxide and ammonium chloride?

A) Endothermic reaction

B) Exothermic reaction

C) Combustion reaction

D) Both [a] and [b]

Key: A

Question 16

Name the area at the back of the throat that connects the buccal cavity with the oesophagus. In this area, the digestive and the respiratory systems cross each other.

A) Larynx

B) Pharynx

C) Salivary glands

D) All of these

Key: B

Question 17

The common ion effect states that the addition of an ion common to two solutes causes _____.

A) precipitation, or reduces ionization

B) vaporization, or melting

C) vaporization, or reduces ionization

D) precipitation, or vaporization

Key: A

Question 18

The basic nature of soap can be tested by using the indicators such as Phenolphthalein. If we add small amount of soap solution in Phenolphthalein, which one of the following colour change will take place?

A) Pink colour

B) No change

C) Green colour

D) Yellow colour

Key: A

Question 19

What is the critical angle of water for which refractive index is 1.33?

A) 24.2°

B) 30.2°

C) 48.6°

D) 44.4°

Key: C

Question 20

Asexual reproduction takes place through budding in_____.

A) Amoeba

B) Yeast

C) Plasmodium

D) Leishmania

Key: B

Question 21

If a cat has 38 chromosomes in each of its body cells, how many chromosomes will be in each daughter cell after mitosis?

A) 11

B) 19

C) 38

D) 76

Key: C

Question 22

If the properties of water were to change so that the solid form was denser than the liquid form, organisms living in a cold pond environment would be less likely to survive because water would no longer —

A) dissolve enough oxygen from the air

B) produce solutions containing vital nutrients

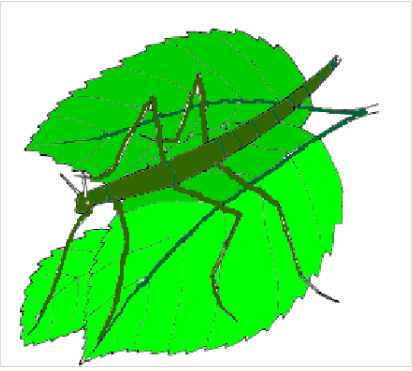
C) remain neutral, instead becoming highly acidic

D) produce a floating insulating layer of ice

Key: D

Question 23

Because of this animal's adaptations, it would be most successful at —



A) competing with birds

B) making its own food

C) hiding from predators

D) running very rapidly

Key: C

Question 24

An advertisement claims that patients can be cured of the common cold in 48 hours by vitamin C tablets with secret mineral supplements. In a scientific experiment to test these claims, which data can be considered irrelevant?

A) The amount of vitamin C in each tablet

B) The severity of the patients' cold symptoms

C) The chemical formula for vitamin C

D) The amount of time before symptoms improve

Key: C

Question 25

A sample of an element has a volume of 78.0 mL and a density of 1.85 g/mL. What is the mass in grams of the sample? Round to the nearest tenth.

A) 14.43 g

B) 144.3 g

C) 42.2 g

D) 79.9 g

Key: B

Question 26

One tuning fork is struck and placed next to an identical fork. The two forks do not touch. The second tuning fork starts to vibrate because of —

A) interference

B) the Doppler effect

C) resonance

D) standing waves

Key: C

Question 27

A block of maple wood with a volume of 405 cubic centimeters and a density of 0.67 g/cm3 is sawed in half. The density of the two smaller blocks is now —

A) one-fourth the original density

B) one-half the original density

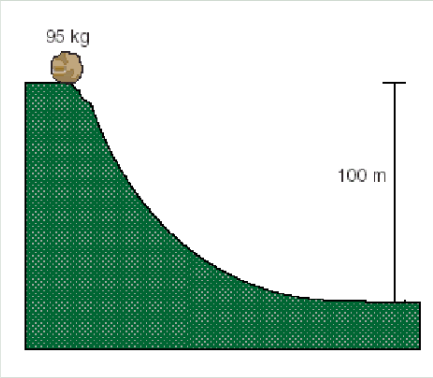
C) two times the original density

D) the same as the original density

Key: D

Question 28

What is the potential energy of the rock?



A) 59,900 joules

B) 64,600 joules

C) 93,100 joules

D) 121,600 joules

Key: C

Question 29

Clown fish are small reef fish that seek protection from predators by sheltering themselves among the stinging tentacles of sea anemones. Clown fish are very territorial and can potentially scare off predators of sea anemones. This relationship is an example of —

A) neutralism

B) mutualism

C) parasitism

D) commensalism

Key: B

Question 30

According to the periodic table, which element most readily accepts electrons?

A) Fluorine

B) Nitrogen

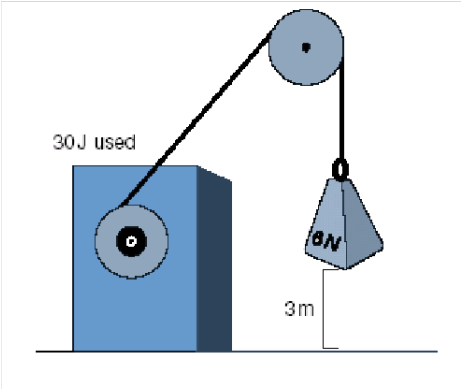
C) Arsenic

D) Aluminum

Key: A

Question 31

The diagram shows an electric motor lifting a 6 N block a distance of 3 m. The total amount of electrical energy used by the motor is 30 J. How much energy does the motor convert to heat?



A) 9 J

B) 12 J

C) 18 J

D) 21 J

Key: B

Question 32

Which process best shows the conversion of solar energy to chemical energy?

A) Prevailing winds causing windmills to spin

B) Green plants making their own food

C) Uranium producing heat to make steam

D) Tides generating electricity

Key: B

Question 33

The table shows environmental factors and soybean production for three regions. Which of the following probably accounts for the decrease in soybean yield in Region 1?

Texas Soybean Production

Study Region	1			2			3		
Soil Type	Loam/clay			Loam/clay			Loam/clay		
Year	1998	1999	2000	1998	1999	2000	1998	1999	2000
Annual Rainfall (centimeters)	123	134	122	120	132	117	132	136	115
Average O_3 Level (parts/million)	0.04	0.08	0.09	0.08	0.08	0.07	0.1[illegible]	0.08	0.06
Average Crop Yield (bushels/acre)	34	28	26	28	27	29	25	28	31

A) High levels of ozone damaged the soybean plants, decreasing the average yield.

B) Low rainfall amounts failed to meet the plants' moisture needs and inhibited growth.

C) Poor mineral levels found in the soil in that region limited the soybean harvest.

D) Higher-than-normal rainfall increased pest activity, decreasing the average yield

Key: A

Question 34

A science class is conducting an experiment that produces noxious fumes. Because of inadequate ventilation, some students begin to feel nauseated and dizzy. The first response should be to —

A) neutralize the acid that is reacting to produce the noxious fumes

B) carry the reactants outside, away from other students

C) leave the room and go to an area with fresh air

D) spray the reaction with a fire extinguisher

Key: C

Question 35

Which question is valid in testing this hypothesis?

> A scientist has hypothesized that the existence of life on Mars is likely because Mars's atmosphere is 95% carbon dioxide.

A) Do most other scientists agree with the hypothesis?

B) Could abiotic processes account for the carbon dioxide?

C) What is the percent of argon compared to carbon dioxide in the Martian atmosphere?

D) Have the scientist's other predictions about Mars been validated?

Key: B

Question 36

Two science students discovered that the mass of a sample of acetone in an open beaker decreased within a few minutes. One student hypothesized that the acetone reacted with oxygen to form a gaseous compound that escaped. The other student believed that the acetone evaporated into the air. What should the students do to test these hypotheses?

A) Combine the hypotheses so they give valid predictions of the acetone's behavior

B) Conduct a study of original papers describing the experiments leading to acetone's discovery

C) Perform an experiment that attempts to identify the gas above the open beaker

D) Ask a classmate's opinion about the chemical and physical properties of acetone

Key: C

Question 37

Nutrients from digested food move from the digestive system directly into the —

A) circulatory system

B) integumentary system

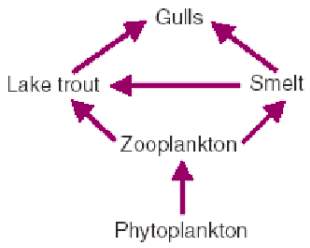
C) excretory system

D) endocrine system

Key: A

Question 38

Which of these groups of organisms would most likely have accumulated the largest concentration of a long-lasting chemical pollutant in their bodies?



A) Phytoplankton

B) Zooplankton

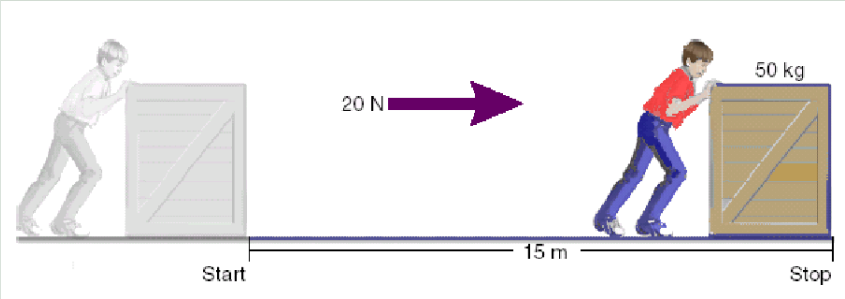
C) Lake trout

D) Gulls

Key: D

Question 39

How much work is performed when a 50 kg crate is pushed 15 m with a force of 20 N?



A) 300 J

B) 750 J

C) 1,000 J

D) 15,000 J

Key: A

Question 40

A portion of the human excretory system is represented in the diagram. The order in which urine flows through the system is —

A) urethra → bladder → ureter → kidney

B) ureter → kidney → bladder → urethra

C) kidney → ureter → bladder → urethra

D) bladder → urethra → kidney → ureter

Key: C

Question 41

Heat convection occurs in gases and liquids. Heat convection does not occur in solids because solids are unable to —

A) absorb heat by vibrating

B) transfer heat by fluid motion

C) emit radiation by reflecting light

D) exchange heat by direct contact

Key: B

Question 42

All of these can affect the rate at which a solid dissolves in water except —

A) decreasing air pressure

B) stirring the water

C) increasing the temperature of the water

D) using larger crystals of the solid

Key: A

Question 43

The smell of an ammonia solution used to clean a floor can quickly be detected throughout a house. Scientists explain this phenomenon by theorizing that gas molecules from the ammonia are in continuous random high-speed motion, drifting rapidly and permeating the air. Which statement best demonstrates the strength of this theory?

A) Scientists have observed tiny smoke particles moved by unseen particles in a rapid, irregular fashion.

B) Scientists have unanimously agreed on this theory since Thomas Graham's experiments in the 1820s.

C) The possibility of another theory being formed to explain the phenomenon as well is very remote.

D) Reason, as opposed to experimentation, is superior to any explanation found through chemical testing.

Key: A

Question 44

An environmental-science company measured the ozone pollutant levels at two different locations in a metropolitan area. Which statement is best supported by these data?

Ozone Levels for a Metropolitan Area

Date	Location	High Temperature (°C)	Prevailing Wind	Ozone Level (ppm)
1/15/99	Downtown	13	NE 5 mph	0.01
	NW Station	11	NE 10 mph	Trace
3/15/99	Downtown	22	Calm	0.03
	NW Station	21	Calm	0.03
5/15/99	Downtown	30	SE 10 mph	0.05
	NW Station	31	SE 5 mph	0.06
7/15/99	Downtown	38	S 5 mph	0.12*
	NW Station	38	S 5 mph	0.14*

*Unsafe levels of ozone above 0.10 ppm

A) Lower fuel efficiency and northerly winds in the winter increase ozone pollution the most.

B) Northwest winds in the spring transport ozone pollution into the metropolitan area.

C) High summer temperatures and southerly winds contribute to high levels of ozone.

D) Heavy use of automobiles changes ozone levels the most.

Key: C

Question 45

Two clear solutions are placed in separate beakers. The first solution has a pH of 4, and the pH of the second solution is unknown. If the two solutions are mixed and the resulting pH is 5, the second solution must have —

A) fewer suspended solids

B) a lower temperature

C) more dissolved salt (NaCl) particles

D) a higher concentration of OH^- ions

Key: D

Question 46

According to the table, which workers have the greatest chance of experiencing significant hearing loss over time?

Sound Intensity

Source	Intensity (dB)
Rustling leaves	20
Library	40
Busy traffic	70
Factory	80
Heavy truck	90
Subway	100
Construction	110
Jet engine	150
Rocket engine	180

90 dB—Endangers hearing
120 dB—Pain threshold

A) Police traffic officers

B) Shoe-factory workers

C) Road-construction crews

D) Library desk clerks

Key: C

Question 47

A solar heater uses energy from the sun to heat water. The heater's panel is painted black to —

A) improve emission of infrared radiation

B) reduce the heat loss by convection currents

C) improve absorption of infrared radiation

D) reduce the heater's conducting properties

Key: C

Question 48

Most viruses infect a specific kind of cell. Which of the following are infected by the human immunodeficiency virus (HIV)?

A) Helper T cells

B) Liver cells

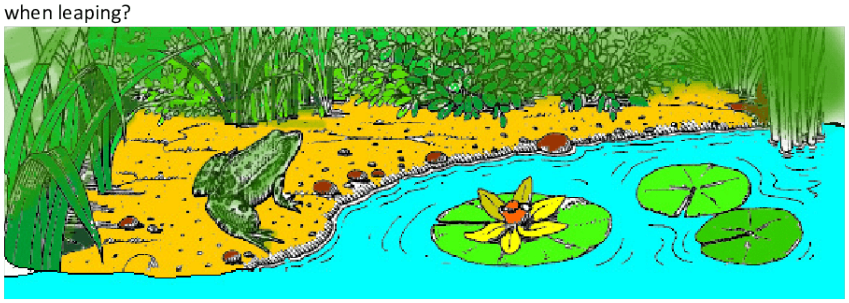
C) GABA-receptor cells

D) Red blood cells

Key: A

Question 49

The frog leaps from its resting position at the lake's bank onto a lily pad. If the frog has a mass of 0.5 kg and the acceleration of the leap is 3 m/s 2, what is the force the frog exerts on the lake's bank when leaping?



A) 0.2 N

B) 0.8 N

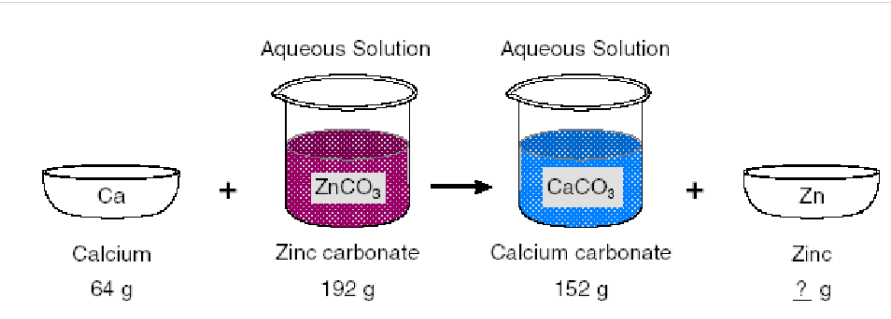
C) 1.5 N

D) 6.0 N

Key: C

Question 50

According to the law of conservation of mass, how much zinc was present in the zinc carbonate?



A) 40 g

B) 88 g

C) 104 g

D) 256 g

Key: C

Question 51

The table shows times required for water to evaporate from identical containers. Which of these is the best question to ask before developing a reasonable hypothesis to explain the data?

Time Required for Water Evaporation

Container	A	B
Volume of Water (mL)	25	25
Temperature (°C)	−15	25
Time Required (h)	72	24

A) Why does a lower temperature slow the rate of evaporation?

B) What is the boiling point of the water after both samples are heated?

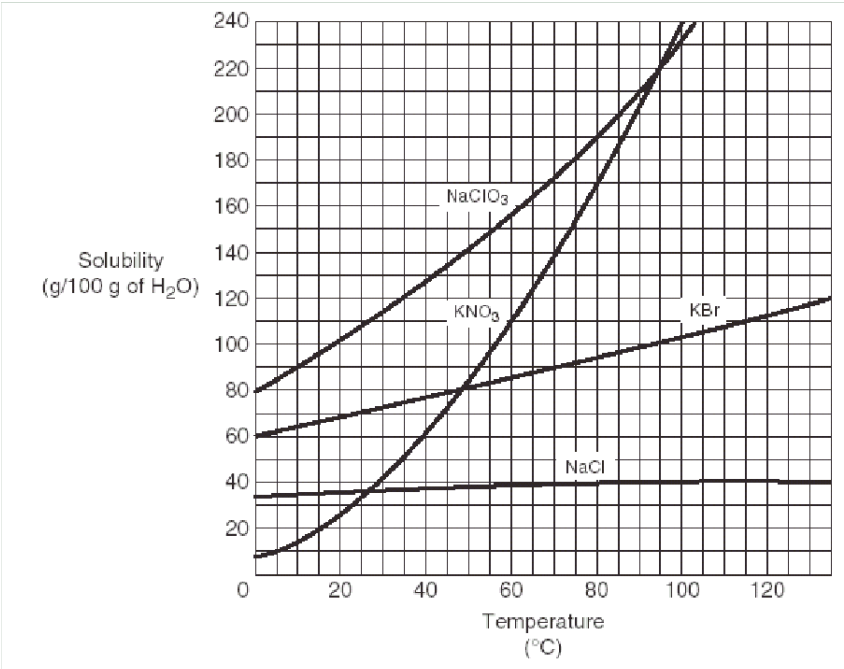
C) Why does water exist as a solid at −15°C and as a liquid at 25°C?

D) How does the rate of evaporation change when a different container is used?

Key: A

Question 52

At which temperature do KBr and KNO3 have the same solubility?



A) 27°C

B) 48°C

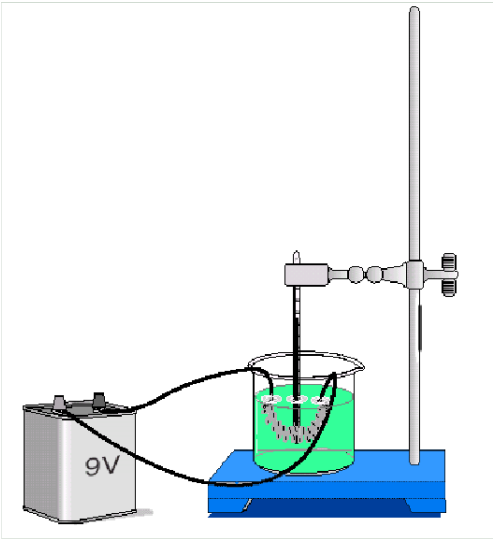
C) 65°C

D) 80°C

Key: B

Question 53

This experiment probably was set up to determine —



A) how much mechanical energy the battery produces

B) the pH of water during electrolysis

C) the pressure created by an electric current

D) how much energy is converted to heat

Key: D

Question 54

If a force of 100 newtons was exerted on an object and no work was done, the object must have —

A) accelerated rapidly

B) remained motionless

C) decreased its velocity

D) gained momentum

Key: B

Question 55

In DNA, which of the following determines the traits of an organism?

A) Amount of adenine

B) Number of sugars

C) Sequence of nitrogen bases

D) Strength of hydrogen bonds

Key: C

Question 56

An herbal company advertises that its product will help people lose weight if they take a tablespoon of the product with a glass of water at bedtime each night. Weight loss is guaranteed if a person does not eat for at least 3 hours before bedtime, gets moderate exercise, and drinks 8 glasses of water each day. Why is the company's claim difficult to verify?

A) The company has yet to disclose the identity of its special herb.

B) Numerous uncontrolled variables are involved in evaluating results.

C) Fasting lessens the absorption rate of the herb.

D) The advertisement lacks data from before and after the weight loss.

Key: B

Question 57

What are the building blocks of lipids?

A. amino acids

B. fatty acids

C. monosaccharides

D. nucleotides

Key: B

Question 58

Which process takes place in the large intestine?

A) Water is added to undigested food.

B) Digested nutrients are absorbed through the villi.

C) Water is absorbed from undigested food.

D) Enzymes are added to complete chemical digestion.

Key: C

Question 59

Atherosclerosis is a condition in which

A) capillaries widen and release too much fluid.

B) veins experience a build up of fatty material.

C) muscles in capillary walls lose their ability to contract.

D) artery walls thicken as the result of a build up of fatty materials.

Key: D

Question 60

To maintain cardiovascular health, foods high in fat should be avoided because

A) they can lead to atherosclerosis.

B) they decrease the force with which the ventricles can contract.

C) they make the blood flow more rapidly than normal.

D) fat in the diet harms red blood cells.

Key: A