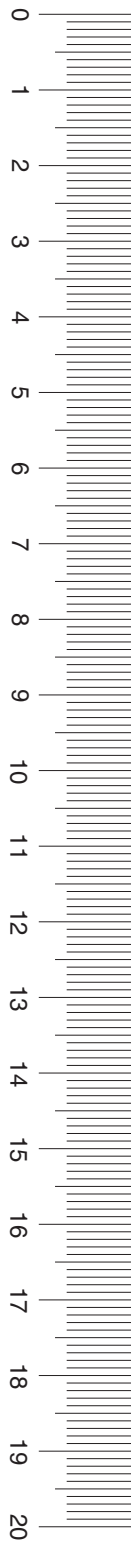


SCIENCE

FORMULA CHART

for Grade 11 Science Assessment

Centimeters



Density = $\frac{\text{mass}}{\text{volume}}$	$D = \frac{m}{v}$
$\left(\begin{array}{l} \text{heat gained or} \\ \text{lost by water} \end{array} \right) = \left(\begin{array}{l} \text{mass in} \\ \text{grams} \end{array} \right) \left(\begin{array}{l} \text{change in} \\ \text{temperature} \end{array} \right) \left(\begin{array}{l} \text{specific} \\ \text{heat} \end{array} \right)$	$Q = (m)(\Delta T)(C_p)$
Speed = $\frac{\text{distance}}{\text{time}}$	$s = \frac{d}{t}$
Acceleration = $\frac{\text{final velocity} - \text{initial velocity}}{\text{change in time}}$	$a = \frac{v_f - v_i}{\Delta t}$
Momentum = mass \times velocity	$p = mv$
Force = mass \times acceleration	$F = ma$
Work = force \times distance	$W = Fd$
Power = $\frac{\text{work}}{\text{time}}$	$P = \frac{W}{t}$
% efficiency = $\frac{\text{work output}}{\text{work input}} \times 100$	$\% = \frac{W_o}{W_i} \times 100$
Kinetic energy = $\frac{1}{2} (\text{mass} \times \text{velocity}^2)$	$KE = \frac{mv^2}{2}$
Gravitational potential energy = mass \times acceleration due to gravity \times height	$GPE = mgh$
Energy = mass \times (speed of light) ²	$E = mc^2$
Velocity of a wave = frequency \times wavelength	$v = f\lambda$
Current = $\frac{\text{voltage}}{\text{resistance}}$	$I = \frac{V}{R}$
Electrical power = voltage \times current	$P = VI$
Electrical energy = power \times time	$E = Pt$

Constants/Conversions		
$g = \text{acceleration due to gravity} = 9.8 \text{ m/s}^2$		
$c = \text{speed of light} = 3 \times 10^8 \text{ m/s}$		
speed of sound = 343 m/s at 20°C		
$1 \text{ cm}^3 = 1 \text{ mL}$		
1 wave/second = 1 hertz (Hz)		
1 calorie (cal) = 4.18 joules		
1000 calories (cal) = 1 Calorie (Cal) = 1 kilocalorie (kcal)		
newton (N) = kgm/s^2		
joule (J) = Nm		
watt (W) = J/s = Nm/s		
volt (V)	ampere (A)	ohm (Ω)

Periodic Table of the Elements

Atomic number — 14
 Symbol — **Si**
 Atomic mass — 28.086
 Silicon — Name

		1		2		3-10										11		12		13		14		15		16		17		18																																																																																																																																																		
		IA		IIA		IIIB			IVB			VB			VIB			VIIB			VIII			IB			IIB			IIIA		IVA		VA		VIA		VIIA		VIIIA																																																																																																																																								
1	1	H 1.008 Hydrogen	2	He 4.0026 Helium	3	Li 6.941 Lithium	4	Be 9.012 Beryllium	5	B 10.81 Boron	6	C 12.011 Carbon	7	N 14.007 Nitrogen	8	O 15.999 Oxygen	9	F 18.998 Fluorine	10	Ne 20.179 Neon	11	Na 22.990 Sodium	12	Mg 24.305 Magnesium	13	Al 26.982 Aluminum	14	Si 28.086 Silicon	15	P 30.974 Phosphorus	16	S 32.066 Sulfur	17	Cl 35.453 Chlorine	18	Ar 39.948 Argon	19	K 39.098 Potassium	20	Ca 40.08 Calcium	21	Sc 44.956 Scandium	22	Ti 47.88 Titanium	23	V 50.942 Vanadium	24	Cr 51.996 Chromium	25	Mn 54.938 Manganese	26	Fe 55.847 Iron	27	Co 58.933 Cobalt	28	Ni 58.69 Nickel	29	Cu 63.546 Copper	30	Zn 65.39 Zinc	31	Ga 69.72 Gallium	32	Ge 72.61 Germanium	33	As 74.922 Arsenic	34	Se 78.96 Selenium	35	Br 79.904 Bromine	36	Kr 83.80 Krypton	37	Rb 85.468 Rubidium	38	Sr 87.62 Strontium	39	Y 88.906 Yttrium	40	Zr 91.224 Zirconium	41	Nb 92.906 Niobium	42	Mo 95.94 Molybdenum	43	Tc (98) Technetium	44	Ru 101.07 Ruthenium	45	Rh 102.906 Rhodium	46	Pd 106.42 Palladium	47	Ag 107.868 Silver	48	Cd 112.41 Cadmium	49	In 114.82 Indium	50	Sn 118.71 Tin	51	Sb 121.763 Antimony	52	Te 127.60 Tellurium	53	I 126.904 Iodine	54	Xe 131.29 Xenon	55	Cs 132.905 Cesium	56	Ba 137.33 Barium	57	La 138.906 Lanthanum	58	Ce 140.12 Cerium	59	Pr 140.908 Praseodymium	60	Nd 144.24 Neodymium	61	Pm (145) Promethium	62	Sm 150.36 Samarium	63	Eu 151.97 Europium	64	Gd 157.25 Gadolinium	65	Tb 158.925 Terbium	66	Dy 162.50 Dysprosium	67	Ho 164.930 Holmium	68	Er 167.26 Erbium	69	Tm 168.934 Thulium	70	Yb 173.04 Ytterbium	71	Lu 174.967 Lutetium	72	Fr (223) Francium	73	Ra 226.025 Radium	74	Ac 227.028 Actinium	75	Th 232.038 Thorium	76	Pa 231.036 Protactinium	77	U 238.029 Uranium	78	Np 237.048 Neptunium	79	Pu (244) Plutonium	80	Am (243) Americium	81	Cm (247) Curium	82	Bk (247) Berkelium	83	Cf (251) Californium	84	Es (252) Einsteinium	85	Fm (257) Fermium	86	Md (258) Mendelevium	87	No (259) Nobelium	88	Lr (262) Lawrencium

Mass numbers in parentheses are those of the most stable or most common isotope.

Lanthanide Series
 Actinide Series

DIRECTIONS

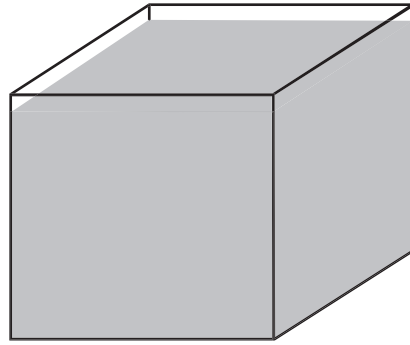
Read each question and choose the best answer. Then fill in the correct answer on your answer document.

SAMPLE A

When a 10% hydrochloric acid solution is heated in an open test tube, the test tube should always be pointed —

- A so bubbles are visible
- B at a 180° angle from the flame
- C toward a ventilated area
- D away from nearby people

SAMPLE B



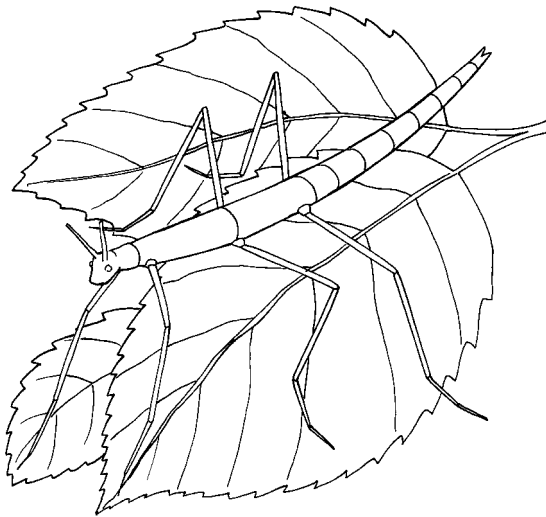
Mass = 40 g

Volume = 20 mL

The picture shows a cube that contains 20 mL of a solution. The solution has a mass of 40 grams. What is the density in g/mL of this solution? Record and bubble in your answer on the answer document.

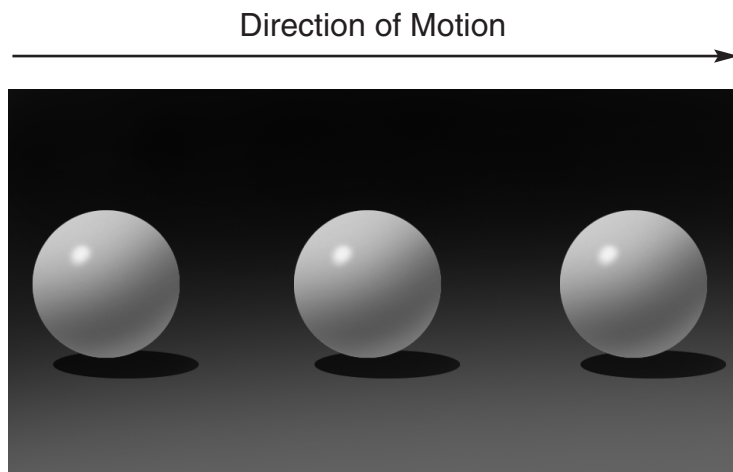


- 1 The safest way to dilute concentrated sulfuric acid is to add —
- A a series of small volumes of water to the acid while stirring
 - B the acid to water slowly while stirring constantly
 - C the acid to a small volume of water and then add more water
 - D dilute sulfuric acid to a small volume of the concentrated acid



- 2 Because of this animal's adaptations, it would be most successful at —
- F competing with birds
 - G making its own food
 - H hiding from predators
 - J running very rapidly

- 3 Which of the following groups contains members with similar chemical reactivity?
- A Li, Be, C
 - B Be, Mg, Sr
 - C Sc, Y, Zr
 - D C, N, O



- 4 The picture shows the position of a ball every 0.25 second on a photogram. Using a ruler, determine the velocity of the ball.
- F 3.5 cm/s
 - G 10.5 cm/s
 - H 14.0 cm/s
 - J 28.0 cm/s

- 5 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.

- 6 Most viruses infect a specific kind of cell. Which of the following are infected by the human immunodeficiency virus (HIV)?
- F Helper T cells
 - G Liver cells
 - H GABA-receptor cells
 - J Red blood cells

CerealCo
presents **New**

Fantastic S

cereal with real fruit

**A wholesome way to tantalize
your tongue and lower your
risk of heart attack!**

Nutrition Information

Serving Size 1 oz (28 g)

Calories:	120
Protein:	5.8 g
Fat:	0.3 g
Carbohydrates	
—Total:	22 g
—Sugars:	5 g
Cholesterol:	0 mg
Dietary fiber:	1.5 g
Sodium:	75 mg
Thiamine:	0.29 mg
Riboflavin:	0.5 mg
Niacin:	2.6 mg
Vitamin B ₆ :	0.5 mg
Folate:	100 μg
Calcium:	300 mg
Iron:	1.5 mg

- 7 Many doctors recommend 800 μg of folate, 400 μg of vitamin B₁₂, and 50 mg of vitamin B₆ per day to improve cardiovascular health. Based on this information and the nutrition label, the cardiovascular health benefit of a 1-ounce serving of this cereal is —
- A doubtful because it provides insufficient folate and vitamin B₆ and lacks vitamin B₁₂
 - B superb because it contains only 22 g of carbohydrates and 75 mg of sodium
 - C excellent because it provides all needed vitamins and is low in fat and cholesterol
 - D poor because it raises blood cholesterol levels with its high fat and cholesterol content

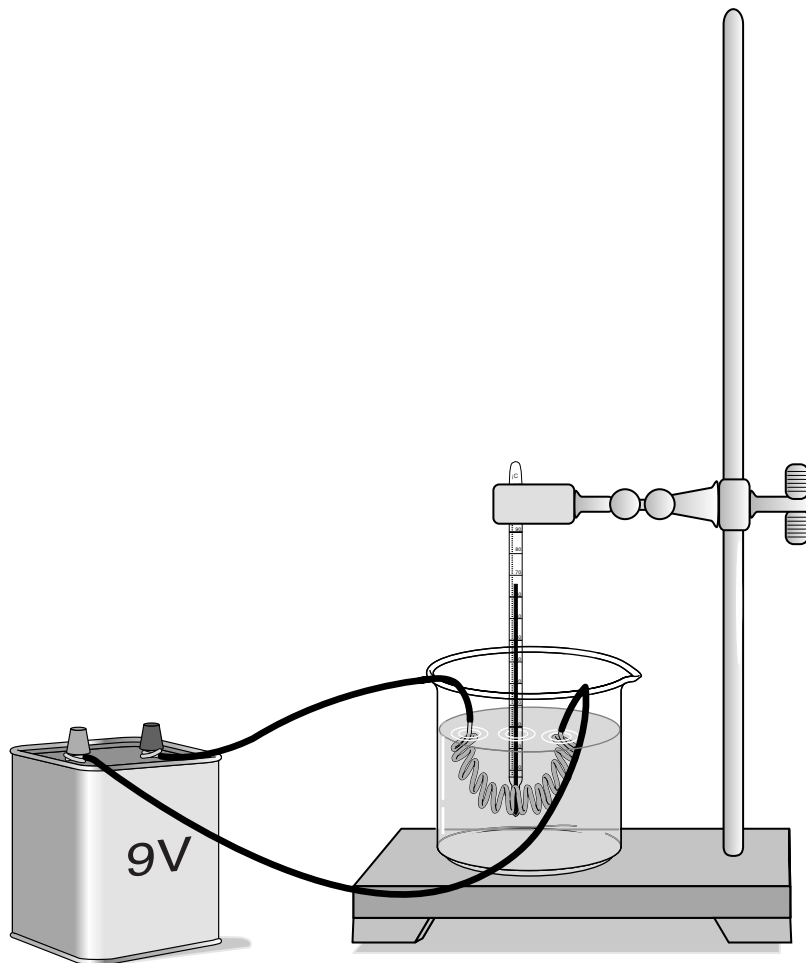
8 Some bacteria benefit mammals by helping with —

F growth

G defense

H digestion

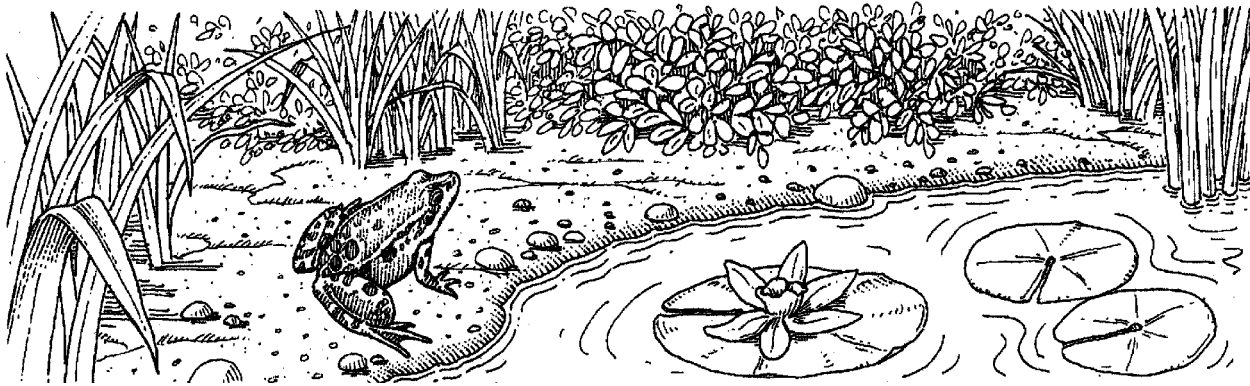
J respiration



- 9 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

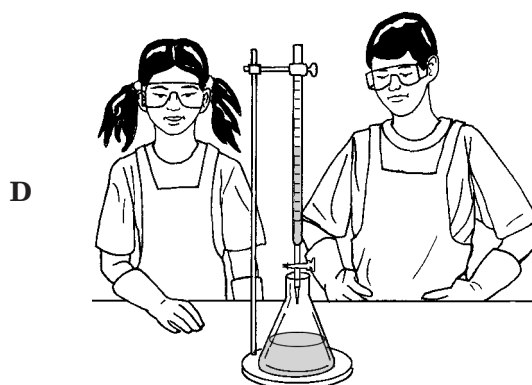
-
- 10 A 0.2 g crystal of gypsum dissolves very slowly in 100 mL of water while the water is stirred. Which of these would cause the gypsum to dissolve faster?
- F Decreasing the water temperature
 - G Stopping the stirring
 - H Lowering the air pressure
 - J Crushing the crystal

Use the illustration below and your knowledge of science to answer questions 11 and 12.



- 11 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
- 12 The bullfrog, *Rana catesbeiana*, is most closely related to the —
- F spotted chorus frog, *Pseudacris clarki*
G Asian flying frog, *Polypedates leucomystax*
H northern leopard frog, *Rana pipiens*
J African bullfrog, *Pyxicephalus adspersus*

- 13 Four lab groups measured the volume of acid required to neutralize a standard solution of sodium hydroxide base. Which of the groups measured the volume with the highest precision?

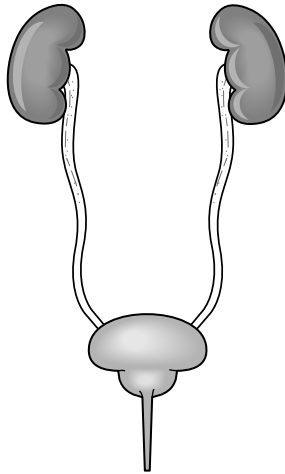


- 14 Which process best shows the conversion of solar energy to chemical energy?

- F Prevailing winds causing windmills to spin
- G Green plants making their own food
- H Uranium producing heat to make steam
- J Tides generating electricity

- 15 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

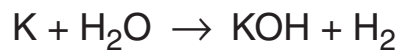


- 16 A portion of the human excretory system is represented in the diagram. The order in which urine flows through the system is —
- F urethra → bladder → ureter → kidney
 - G ureter → kidney → bladder → urethra
 - H kidney → ureter → bladder → urethra
 - J bladder → urethra → kidney → ureter

-
- 17 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

18 Energy used by producers in a grassland food web is provided by —

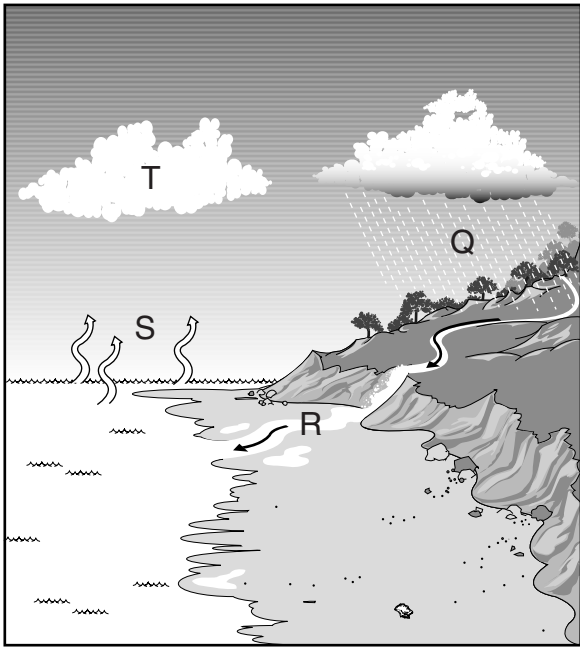
- F sunlight
- G photosynthesis
- H oxygen
- J carbon dioxide



19 What is the coefficient for H_2O when the above equation is balanced?

- A 1
- B 2
- C 3
- D 4

20 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? Record and bubble in your answer to the nearest tenth on the answer document.



21 The diagram shows physical changes that occur in the water cycle. Which of these shows condensation?

- A Q
- B R
- C S
- D T

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	0.10	0.08	0.06
Average Crop Yield (bushels/acre)	34	28	26	28	27	29	25	28	31

- 22** 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?
- F** High levels of ozone damaged the soybean plants, decreasing the average yield.
 - G** Low rainfall amounts failed to meet the plants' moisture needs and inhibited growth.
 - H** Poor mineral levels found in the soil in that region limited the soybean harvest.
 - J** Higher-than-normal rainfall increased pest activity, decreasing the average yield.

- 23** According to the periodic table, which element most readily accepts electrons?
- A** Fluorine
 - B** Nitrogen
 - C** Arsenic
 - D** Aluminum

24 If the template of a strand of DNA is $5' \text{AGATGCATC} 3'$, the complementary strand will be —

F $3' \text{TCTACGTAG} 5'$

G $5' \text{CTACGTAGA} 3'$

H $3' \text{AGATGCATC} 5'$

J $5' \text{AGACGTCTA} 3'$

25 A block of maple wood with a volume of 405 cubic centimeters and a density of 0.67 g/cm^3 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

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

F 11

G 19

H 38

J 76

27 A ball moving at 30 m/s has a momentum of $15 \text{ kg}\cdot\text{m/s}$. The mass of the ball is —

A 45 kg

B 15 kg

C 2.0 kg

D 0.5 kg

Time Required for Water Evaporation

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

- 28 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?
- F Why does a lower temperature slow the rate of evaporation?
 - G What is the boiling point of the water after both samples are heated?
 - H Why does water exist as a solid at -15°C and as a liquid at 25°C ?
 - J How does the rate of evaporation change when a different container is used?

- 29 Nutrients from digested food move from the digestive system directly into the —
- A circulatory system
 - B integumentary system
 - C excretory system
 - D endocrine system

- 30 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?
- F The company has yet to disclose the identity of its special herb.
 - G Numerous uncontrolled variables are involved in evaluating results.
 - H Fasting lessens the absorption rate of the herb.
 - J The advertisement lacks data from before and after the weight loss.

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

- 31** 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?
- 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.

32 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 —

- F** interference
- G** the Doppler effect
- H** resonance
- J** standing waves

33 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 —

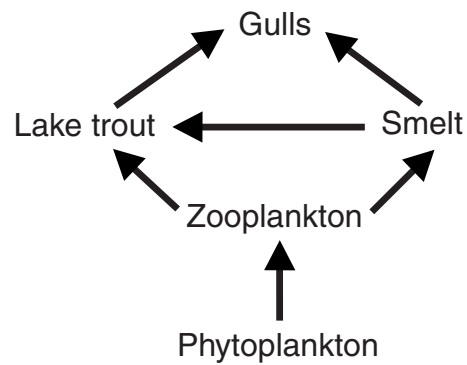
- A** fewer suspended solids
- B** a lower temperature
- C** more dissolved salt (NaCl) particles
- D** a higher concentration of OH⁻ ions

- 34 When a sea urchin egg is removed from the ocean and placed in freshwater, the egg swells and bursts. Which of these causes water to enter the egg?
- F Coagulation
 - G Sodium pump
 - H Active transport
 - J Osmosis

- 35 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

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

- 36 Which question is valid in testing this hypothesis?
- F Do most other scientists agree with the hypothesis?
 - G Could abiotic processes account for the carbon dioxide?
 - H What is the percent of argon compared to carbon dioxide in the Martian atmosphere?
 - J Have the scientist's other predictions about Mars been validated?

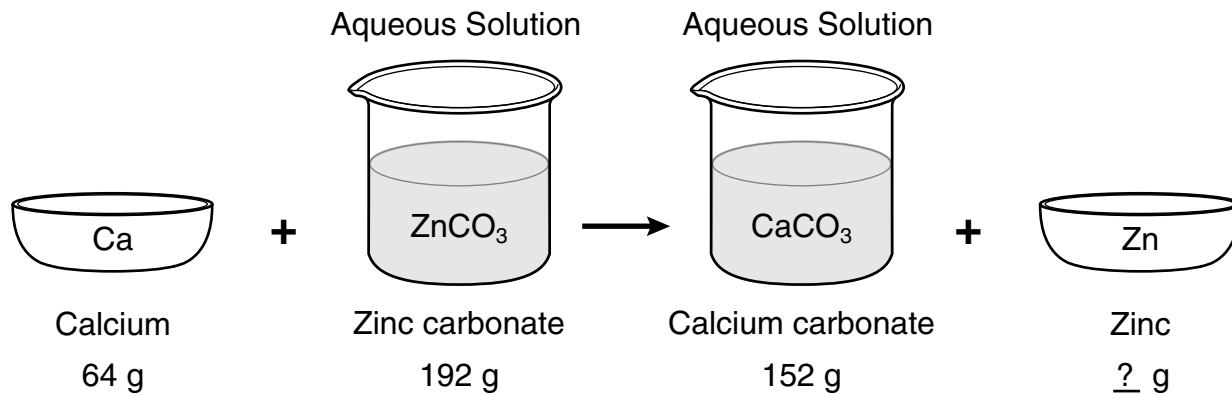


- 37 Which of these groups of organisms would most likely have accumulated the largest concentration of a long-lasting chemical pollutant in their bodies?

- A Phytoplankton
- B Zooplankton
- C Lake trout
- D Gulls

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

- F Amount of adenine
- G Number of sugars
- H Sequence of nitrogen bases
- J Strength of hydrogen bonds

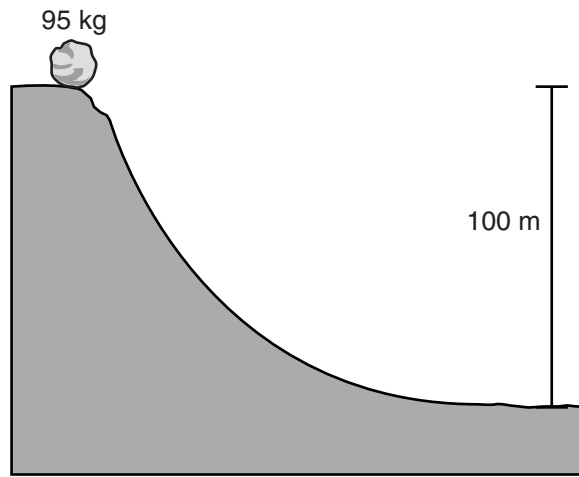


39 According to the law of conservation of mass, how much zinc was present in the zinc carbonate?

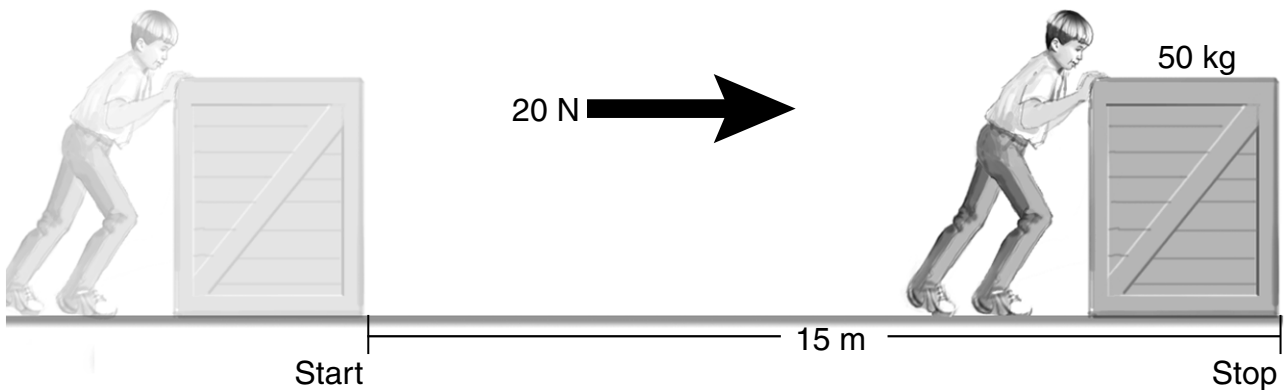
- A 40 g
- B 88 g
- C 104 g
- D 256 g

40 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 —

- F dissolve enough oxygen from the air
- G produce solutions containing vital nutrients
- H remain neutral, instead becoming highly acidic
- J produce a floating insulating layer of ice



- 41 What is the potential energy of the rock?
- A 59,900 joules
 - B 64,600 joules
 - C 93,100 joules
 - D 121,600 joules



- 42 How much work is performed when a 50 kg crate is pushed 15 m with a force of 20 N?
- F 300 J
 - G 750 J
 - H 1,000 J
 - J 15,000 J

- 43 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

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

- 44 According to the table, which workers have the greatest chance of experiencing significant hearing loss over time?
- F Police traffic officers
 - G Shoe-factory workers
 - H Road-construction crews
 - J Library desk clerks

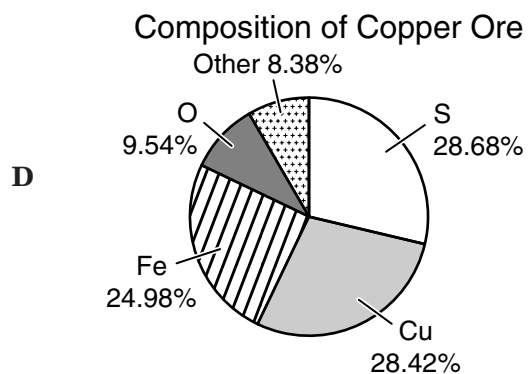
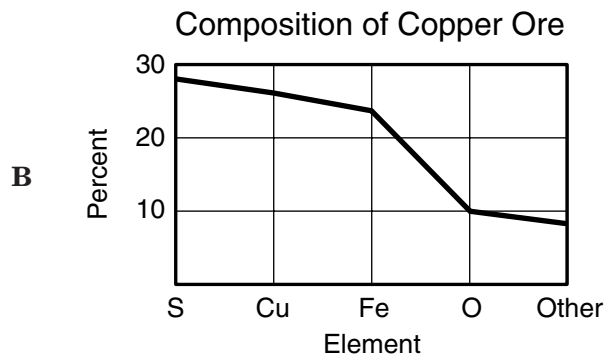
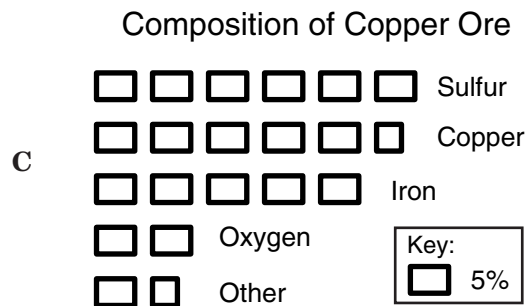
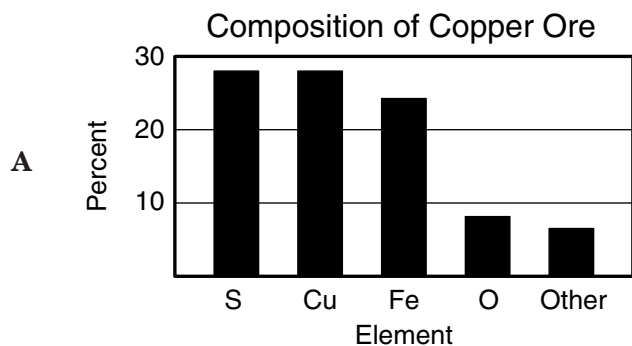
- 45 If a force of 100 newtons was exerted on an object and no work was done, the object must have —
- A accelerated rapidly
 - B remained motionless
 - C decreased its velocity
 - D gained momentum

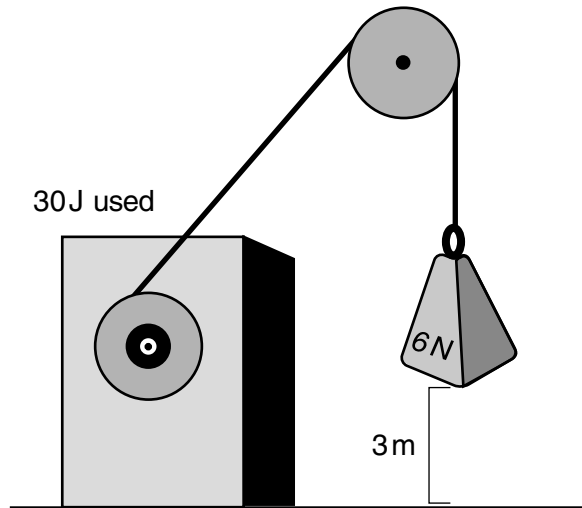
- 46 Two science students discovered that the mass of a sample of acetone in an open beaker decreased within a few minutes. One student hypothesized that the acetone reacted with oxygen to form a gaseous compound that escaped. The other student believed that the acetone evaporated into the air. What should the students do to test these hypotheses?
- F Combine the hypotheses so they give valid predictions of the acetone's behavior
 - G Conduct a study of original papers describing the experiments leading to acetone's discovery
 - H Perform an experiment that attempts to identify the gas above the open beaker
 - J Ask a classmate's opinion about the chemical and physical properties of acetone

Composition of a Copper Ore

Element	Percent
Sulfur	28.68
Copper	28.42
Iron	24.98
Oxygen	9.54
Other	8.38
Total	100

47 Which graph best shows the comparison of the elements to the total composition of the copper ore?

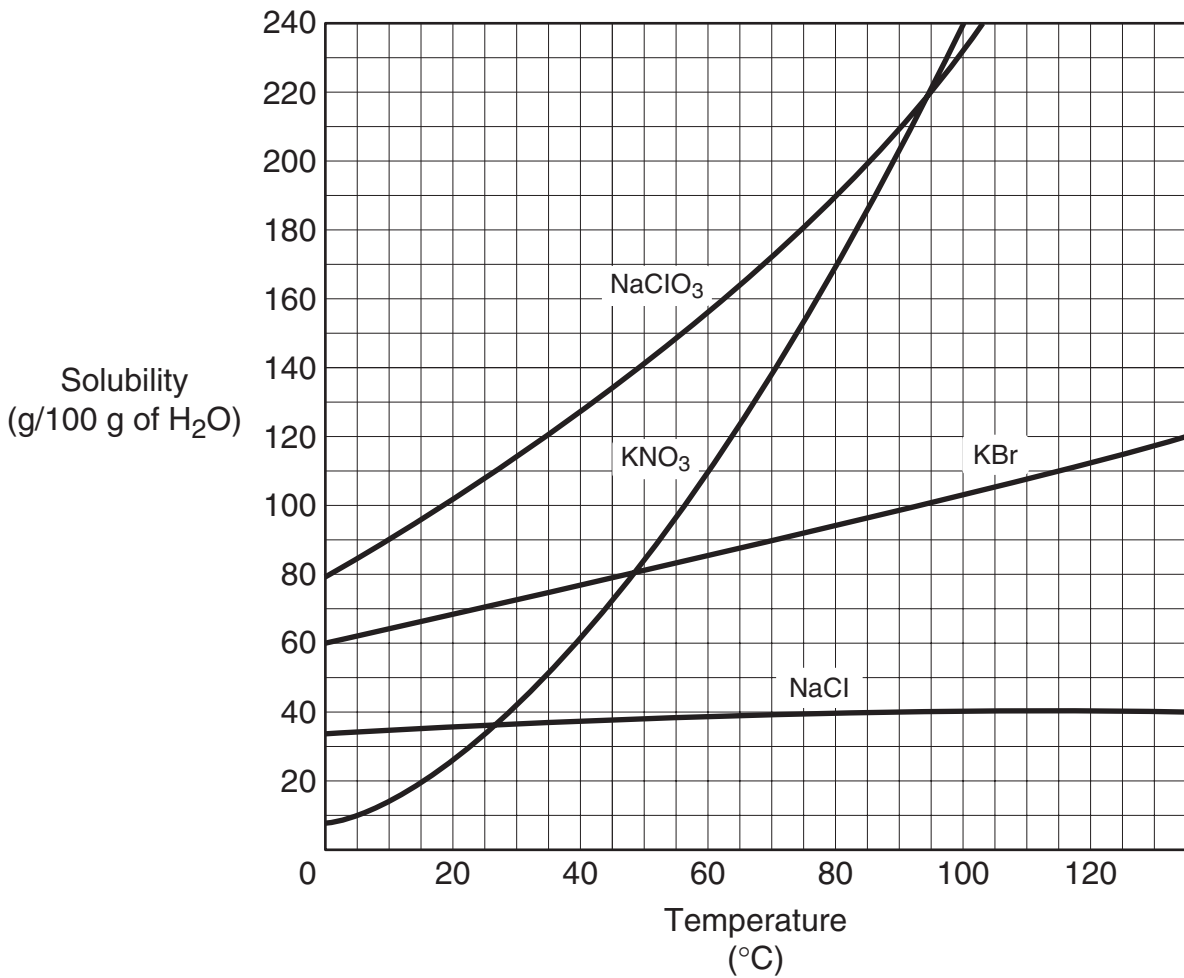




- 48 The diagram shows an electric motor lifting a 6 N block a distance of 3 m. The total amount of electrical energy used by the motor is 30 J. How much energy does the motor convert to heat?
- F 9 J
 - G 12 J
 - H 18 J
 - J 21 J

- 49 Which of these classifications is most specific?
- A Family
 - B Genus
 - C Phylum
 - D Order

- 50 A solar heater uses energy from the sun to heat water. The heater's panel is painted black to —
- F improve emission of infrared radiation
 - G reduce the heat loss by convection currents
 - H improve absorption of infrared radiation
 - J reduce the heater's conducting properties



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

- A 27°C
- B 48°C
- C 65°C
- D 80°C

52 Compared to annual rings of trees that have experienced years of sufficient rainfall, the annual rings of trees that have experienced a dry period will —

- F be softer
- G grow at a faster rate
- H be thinner
- J photosynthesize at a faster rate

Amino Acid Composition of Cytochrome c in Some Organisms

Amino Acid	Organism Q	Organism R	Organism S	Organism T
Alanine	10%	10%	10%	10%
Arginine	4%	4%	4%	4%
Aspartic acid	6%	6%	6%	6%
Cysteine	6%	6%	6%	4%
Glutamic acid	12%	12%	8%	8%
Glycine	4%	2%	4%	4%
Valine	2%	1%	4%	6%

53 The table shows a comparison of some amino acids found in cytochrome c. The two organisms in the table that are most closely related are —

- A Q and T
- B R and S
- C Q and R
- D Q and S

54 Which of these activities can help conserve natural resources?

- F Recycling cardboard boxes
- G Washing small loads of laundry
- H Driving large cars
- J Building wooden fences

55 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

BE SURE YOU HAVE RECORDED ALL OF YOUR ANSWERS
ON THE ANSWER DOCUMENT.



