

Name: \_\_\_\_\_

# Science HSPE

## Practice Instructional Materials #1

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**This booklet contains science questions for you to answer. The questions in the Practice Instructional Material are all multiple-choice. For each question, you will be given four answer choices—A, B, C, and D. You are to choose the correct answer from the four choices. Each question has only one correct answer.**



**1** What molecule allows hereditary information to be passed from generation to generation?

- A ATP
- B Proteins
- C Amino Acids
- D DNA

**2** Which statement **best** describes the cell membrane in a typical cell? The membrane

- A is composed of a single protein layer with lipids floating inside.
- B selectively controls what enters and exits the cell.
- C is composed only of protein and carbohydrates.
- D has the same permeability to all substances moving into and out of the cell.

**3** A lava field is bare for several years when lichens begin to grow on the rocks. The lichens are gradually replaced with grasses, shrubs, and finally trees. This process is called

- A secondary homeostasis.
- B primary homeostasis.
- C secondary succession.
- D primary succession.

**4** Which statement **best** describes a benefit of artificial selection?

Selectively bred organisms

- A may have shorter life spans compared to animals that were not bred.
- B provide farmers with higher yielding crops and possibly more profits.
- C are more susceptible to disease or changes in the environment.
- D have different gene frequencies compared to those found in natural populations.

**5** Which of the following provides the **best** evidence for determining the phylogeny of three very closely related organisms?

- A Investigating their scientific names.
- B Analyzing their DNA.
- C Comparing their anatomical structures.
- D Examining their fossil records.

**6** If a parasite invades the small intestine of an animal, what effect will it most likely have on the body?

- A Interferes with nutrient absorption.
- B Disrupts balance causing blindness.
- C Increases water retention.
- D Decreases white blood cell count.

**7** Which observation **best** helps distinguish between plant cells and animal cells?

- A Plant cells have a rigid cell wall and animal cells do not.
- B Animal cells have more DNA in their nucleus than plant cells.
- C Animal cells contain a large central vacuole and plant cells contain many small vacuoles.
- D Plant cells produce energy by using chloroplasts instead of mitochondria.

**8** An adult develops a type of skin cancer called melanoma. The cancer

- A cannot be passed to children because the cancer is in a gamete cell.
- B can be passed to children because the cancer is in a somatic cell.
- C cannot be passed to children because the cancer is in a somatic cell.
- D can be passed to children because the cancer is in a gamete cell.

**9** In a marine ecosystem, disease killed most of the sea otters. This caused the sea urchins and clams to increase in number. As a result, the sea gull population increased and the seaweed population decreased. Identify a secondary consumer in this marine ecosystem.

- A Seaweed
- B Sea gull
- C Clam
- D Sea urchin

**10** Use the table below to answer the following question.

	<b>Species 1</b>	<b>Species 2</b>	<b>Species 3</b>	<b>Species 4</b>
<b>Kingdom</b>	Animalia	Animalia	Animalia	Animalia
<b>Phylum</b>	Chordata	Chordata	Chordata	Chordata
<b>Class</b>	Mammalia	Mammalia	Mammalia	Mammalia
<b>Order</b>	Carnivora	Carnivora	Artiodactyla	Carnivora
<b>Family</b>	Felidae	Otariidae	Ceridae	Felidae
<b>Genus</b>	<i>Felis</i>	<i>Zalophus</i>	<i>Odocoileus</i>	<i>Panthera</i>
<b>Species</b>	<i>catus</i>	<i>californianus</i>	<i>virginianus</i>	<i>pardus</i>

Based upon the information in the table, which two species are most closely related?

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



11

Nevada has a very high biodiversity compared to other states. Which reason **best** explains why this is the case?

- A It has numerous ecosystems due to its basin and range topography.
- B It receives more precipitation on average compared to other states.
- C It is a large state in terms of area compared to other states.
- D It has few people to disturb plant and animal habitats.

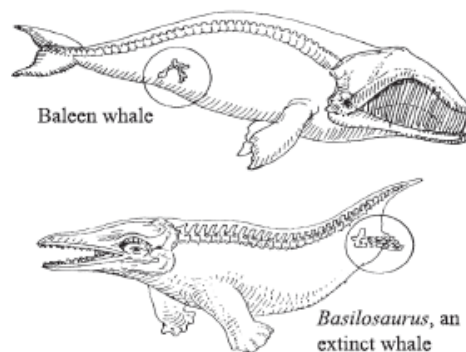
12

In rabbits, brown (B) fur is dominant to white (b) fur. If a rabbit with the genotype Bb is crossed with a rabbit with a genotype bb, what percentage of the offspring are expected to have brown fur?

- A 0%
- B 25%
- C 50%
- D 100%

13

The illustration below shows the pelvic bone of a modern day baleen whale and a reconstruction of an extinct whale based upon fossil evidence.

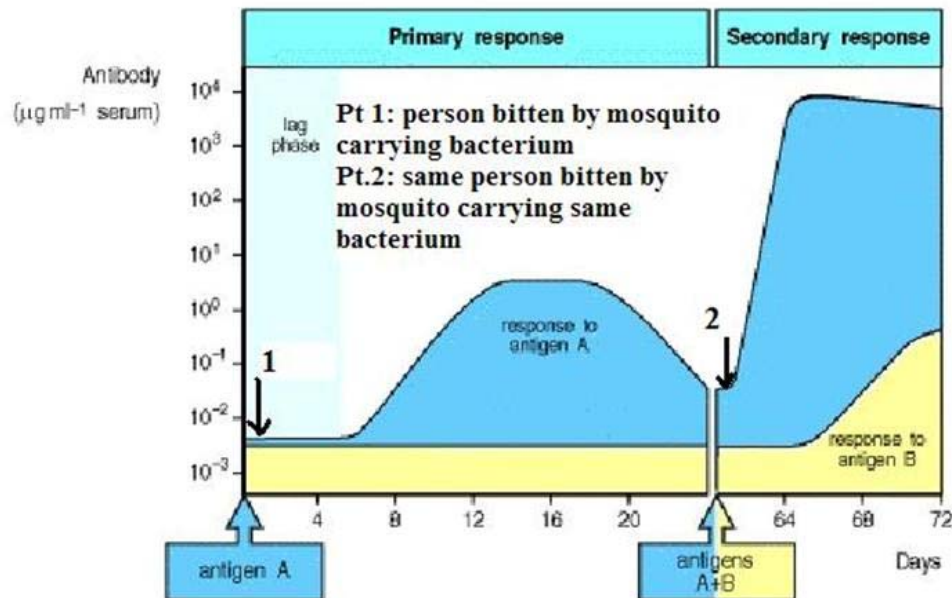


<http://www.doe.mass.edu/mcas/search/>

What is the **best** explanation for the presence of the vestigial limbs in both whale species?

- A Whales have functioning hind limbs and can walk on land when necessary.
- B Whales are evolving into a species that will eventually have four legs.
- C Whales evolved from a species that had functioning hind limbs.
- D Whales lost their hind limbs because they stopped using them.

- 14 Use the graph below to answer the following question. This graph shows the number of antibodies in a sample of blood over a period of time.



<http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=imm&part=A38>

What is the **best** reason why the secondary response is greater than the primary response?

- A Antibodies from the primary response still remained in the blood.
- B More bacteria entered at point 2 than at point 1.
- C Macrophages increased their production of antibodies.
- D Memory cells were produced during primary response.

**15** If a human egg cell with 24 chromosomes is fertilized by a sperm cell containing 23 chromosomes, what will be the result? The offspring will

- A** resemble the mother more than the father.
- B** resemble the father more than the mother.
- C** inherit a disorder due to a missing chromosome.
- D** inherit a disorder due to the extra chromosome.

**16** In pea plants, yellow pea pods are dominant to green pea pods and round-shaped pods are dominant to wrinkled pods. The offspring of two plants that are heterozygous for yellow, round pods display four different phenotypes.

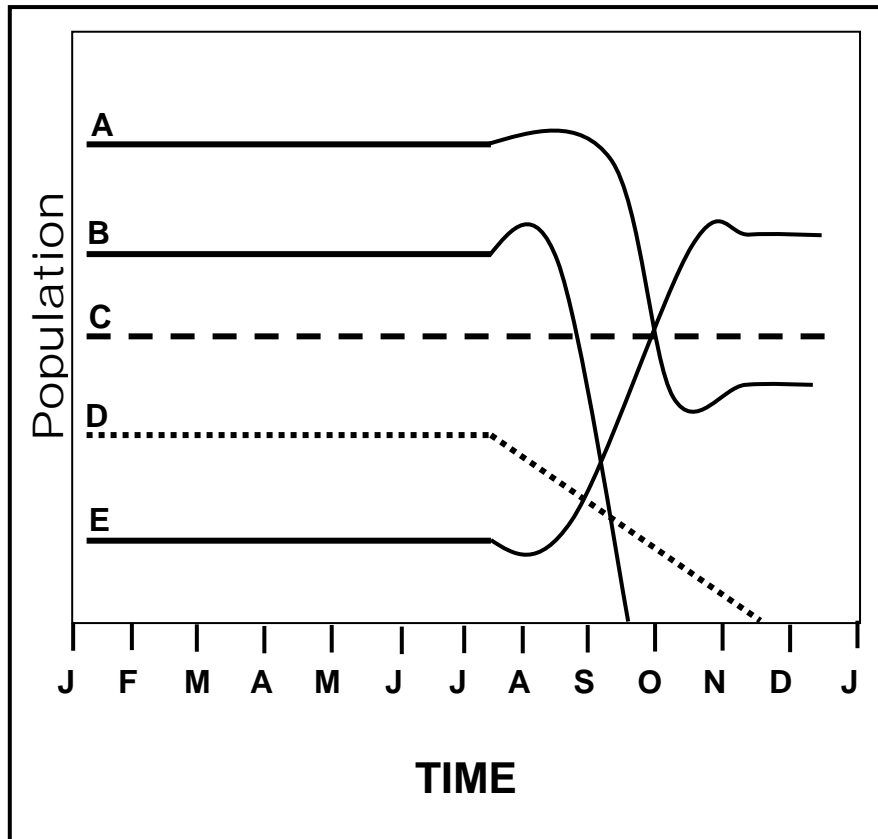
The results are explained by

- A** random fertilization during sexual reproduction.
- B** independent assortment of chromosomes during meiosis.
- C** mutation in the DNA of the gametes.
- D** crossing over between chromosomes during meiosis.

**17** A student observes a rocky coastal ecosystem over a period of time. As the water begins to go out due to the tides, the animals change behaviors. The clams and mussels close up to prevent water loss and drying out, the crabs move under rocks or into small pools of water in the rocks for shelter, sea birds walk along the rocks eating small organisms, and a raccoon comes down to the shore to eat the exposed mussels and clams. Which statement is a conclusion specific to how an abiotic factor met the needs of an organism?

- A** The crabs finding shelter under rocks or in pools of water.
- B** The sea birds eating organisms off the rocks.
- C** The raccoon eating the clams and mussels.
- D** The clams and mussels closing up to prevent losing water.

- 18** Use the graph below to answer the following question. This graph shows the population trends of five populations over time.

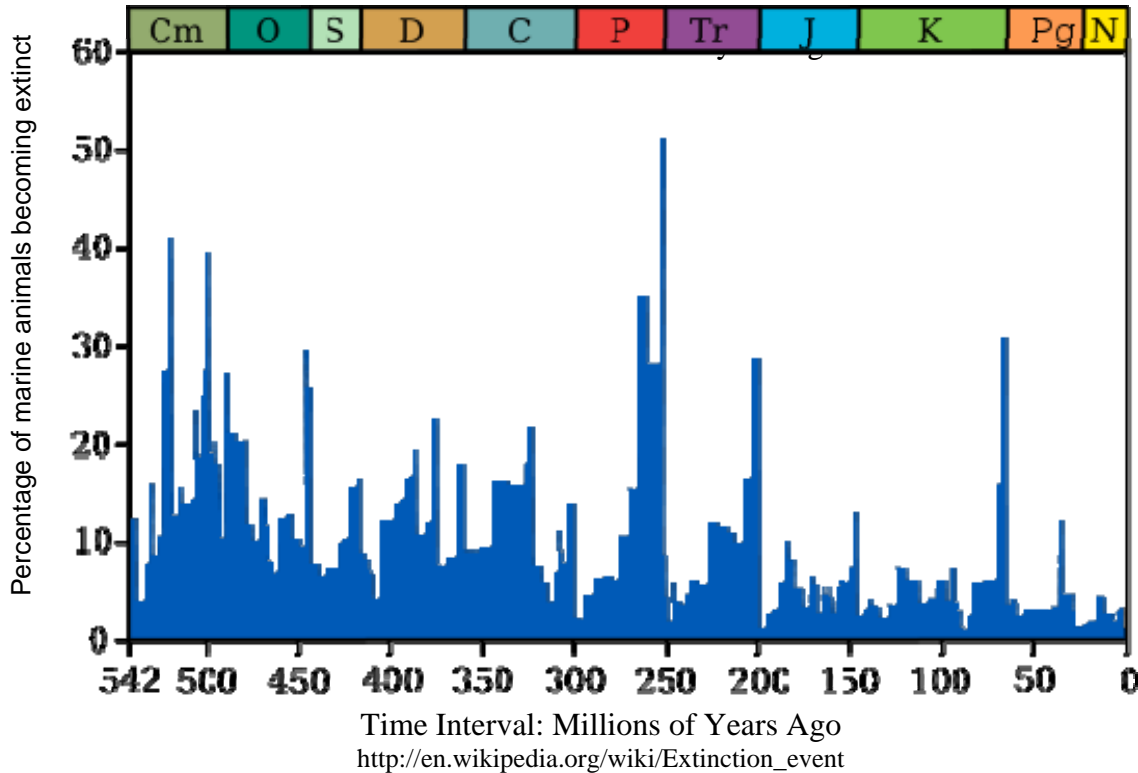


Which statement is the **best** explanation for the changes in population E?

- A Species C moved into the niche previously occupied by species B resulting in an increase in species E.
- B The decline in B and D reduced the competition for resources resulting in an increase in species E.
- C Species E started eating species A because the increase in E occurs concurrently with the decrease in A.
- D Individuals of species E immigrated into this habitat from the surrounding areas.



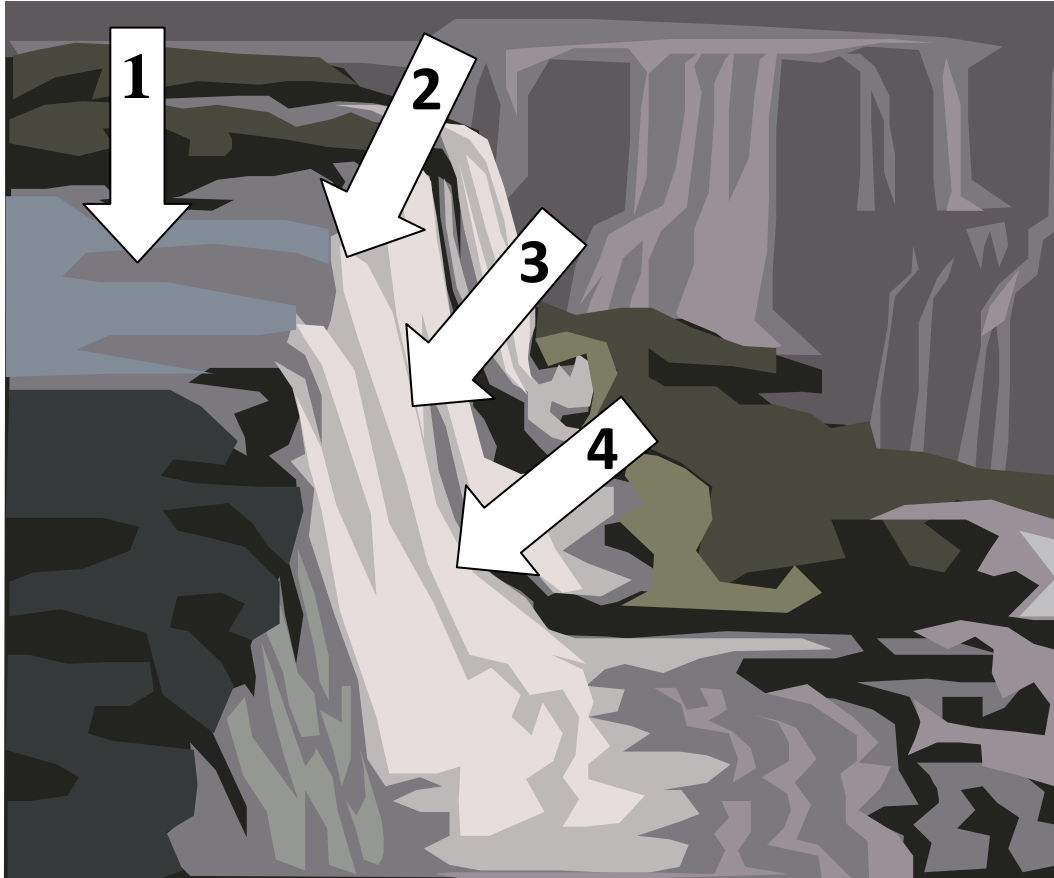
- 19** Use the graph below to answer the following question. The graph shows the percent of marine animals that became extinct through the past 542 million years.



What can you infer based on the graph?

- A The greatest mass extinction occurred about 85 million years ago.
  - B In general, fewer species became extinct in the present than in the past 542 million years.
  - C The greatest mass extinction occurred about 300 million years ago.
  - D In general, more species became extinct in the present than in the past 542 million years.
- 20** Two blocks of metal are placed into an insulated container and there is a net transfer of heat between the blocks. Which of the following statements is true?
- A The blocks started with the same temperature.
  - B The blocks started with different temperatures.
  - C The blocks have the same melting point.
  - D The blocks have a different specific heat.

**21** Use the diagram of a waterfall to answer the following question.



Where would placing a generator produce the largest amount of energy?

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

- 22** The rate of a certain reaction doubles with every  $10^{\circ}\text{C}$  increase in temperature. Which of the following would be true of this reaction?
- A The particles of the reactants are losing energy.
  - B The particles of the reactants are increasing in size.
  - C The particles of the reactants are colliding more frequently.
  - D The particles of the reactants are getting farther apart.
- 23** One practical application of radioactivity includes
- A diagnosing and treating medical conditions.
  - B creating and modifying foods.
  - C measuring air speed.
  - D improving gas combustion.
- 24** Which of the following boxes would have the **most** friction acting upon it?
- A A smooth metal box being pushed across a smooth wooden floor.
  - B A rough cardboard box being pushed across a smooth wooden floor.
  - C A rough cardboard box being pushed across a rough carpeted floor.
  - D A smooth metal box being pushed across a rough carpeted floor.
- 25** Two objects are at a fixed distance from each other. As the masses of these two objects increases, the strength of the gravitational forces between them
- A increases.
  - B decreases.
  - C increases then decreases.
  - D decreases then increases.
- 26** A toy car with initial kinetic energy rolls to a stop along a flat track. Because of friction, some of the kinetic energy was transferred as
- A gravitational potential energy.
  - B thermal energy.
  - C chemical energy.
  - D elastic energy.
- 27** What is happening to the particles of a gas as it changes phase into a liquid? They
- A speed up and become closer because energy is being removed.
  - B speed up and spread apart because energy is being added.
  - C slow down and become closer because energy is being removed.
  - D slow down and spread apart because energy is being added.

**28**

Use the periodic table below to answer the following question.

**Periodic Table of the Elements**

1	IA																						O													
1	H																	He																		
2	IIA																		III A	IVA	VA	VIA	VIIA	10												
2	Li	Be																	B	C	N	O	F	Ne												
3																			13	14	15	16	17	18												
3	Na	Mg																	Al	Si	P	S	Cl	Ar												
4																			IB	IIB																
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																		
5																			49	50	51	52	53	54												
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe																		
6																			81	82	83	84	85	86												
6	Cs	Ba	*La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																		
7																			113																	
7	Fr	Ra	+Ac	Rf	Ha	Sg	Ns	Hs	Mt	110	111	112																								

* Lanthanide Series	58	59	60	61	62	63	64	65	66	67	68	69	70	71
	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
+ Actinide Series	90	91	92	93	94	95	96	97	98	99	100	101	102	103
	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

<http://genesismission.jpl.nasa.gov/gm2/science/images/fig15.gif>

Which of the following pairs share similar chemical properties?

- A Oxygen (O) and Chlorine (Cl)
- B Fluorine (F) and Neon (Ne)
- C Bromine (Br) and Iodine (I)
- D Helium (He) and Hydrogen (H)



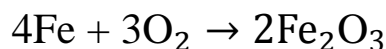
**29** A student has a mixture of sand, water, salt and iron pieces. Which procedure would separate the mixture?

- A Filter the water to separate the salt, use a magnet to remove the iron.
- B Filter the water to separate the sand, use a magnet to remove the iron.
- C Filter the sand and iron from the water, use a magnet to remove the iron from the sand, evaporate the water to separate the salt.
- D Filter the sand and iron from the water, evaporate the water to separate the salt.

**30** Batteries can be used in a device for a limited amount of time because much of the available

- A mass of the chemicals in the batteries has been used up.
- B electrical energy in the batteries has been converted into heat.
- C potential chemical energy has been converted into mass.
- D potential chemical energy has been converted into other types of energy.

**31** The following balanced equation represents the reaction between iron (Fe) and oxygen (O<sub>2</sub>) to form iron (III) oxide.



This equation supports the conservation of mass principle because there are

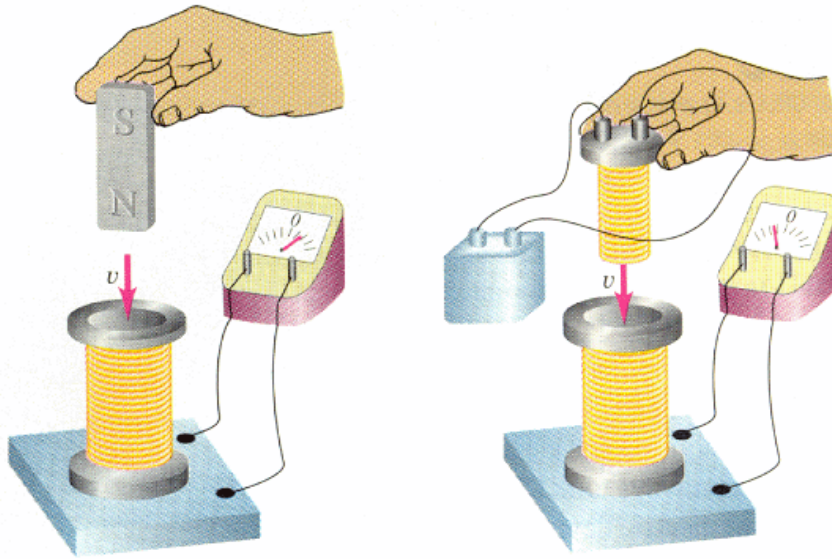
- A 10 total iron and oxygen atoms involved in the reaction.
- B 20 total iron and oxygen atoms involved in the reaction.
- C 4 iron atoms and 6 oxygen atoms before and after the reaction.
- D 4 iron atoms and 3 oxygen atoms before and after the reaction.

**32** A hammer strikes a nail and drives the nail into a block of wood. If the action force is the hammer striking the nail, the reaction force is the

- A wood striking the nail with an equal and opposite force.
- B nail striking the hammer with an equal and opposite force.
- C wood striking the hammer with an equal and opposite force.
- D nail striking the wood with an equal and opposite force.

33

Use the diagram below to answer the following question. The diagram displays methods of electromagnetic induction.



[http://www.physics.uiowa.edu/~umallik/adventure/nov\\_06-04.html](http://www.physics.uiowa.edu/~umallik/adventure/nov_06-04.html)

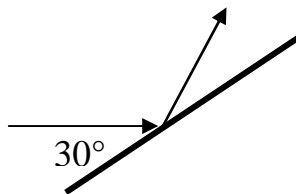
Which of the following **best** describes the principle of electromagnetic induction?

- A When two charged objects are held close together they will either attract each other or repel each other through electromagnetic forces.
- B A magnetic field moving through a coil of wire causes an electric current and an electric current in a coil of wire causes a magnetic field.
- C The flow of electrons through either a series or parallel circuit is known as an electric current.
- D Any metal object inserted into a coil of wire initiates an electric current.

**34** Which statement **best** explains why astronauts weigh less on the Moon than they do on Earth?

- A As the astronauts travel away from the Earth, they lose mass and weigh less on the Moon.
- B On the Moon there is no air and this lack of air pressure causes the astronauts to be weightless.
- C The Earth's gravitational force affects all masses, and the Moon is far from Earth.
- D The Moon has less mass, so gravitational force is less on the Moon's surface.

**35** Use the diagram below to answer the following question. A ray of light is transferring energy towards a mirror at a 30-degree angle to the mirror surface.



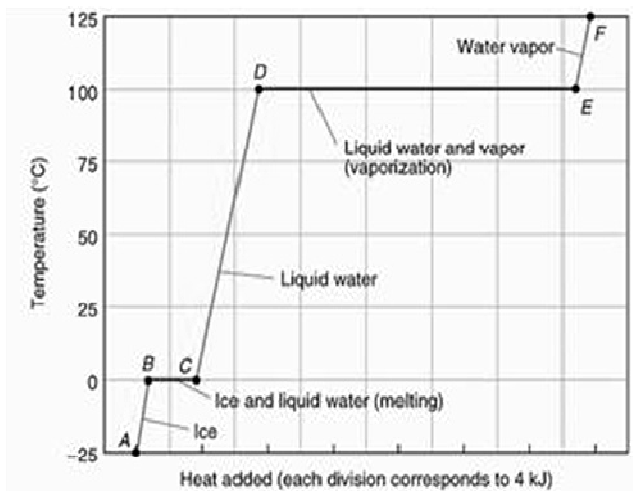
What will be the angle of reflection?

- A 30 degrees
- B 60 degrees
- C 90 degrees
- D 45 degrees

**36** Aluminum was once used as the wires in home construction. Recently, it was changed to copper wires. Which statement **best** accounts for why aluminum was replaced with copper?

- A The electrical energy that a copper wire can transfer is less than an aluminum wire.
- B The electrical energy that passes through an aluminum wire cannot be directed as well as the energy passing through copper wire.
- C As a byproduct of transmission, more electrical energy is transformed to wasted thermal energy in aluminum wire than in copper wire.
- D When electrical energy is passed through a copper wire, less of the energy removes copper atoms from the wire.

- 37** Use the graph below to answer the following question. The graph represents the temperature of water as a function of energy added to the water.



During which intervals are the average kinetic energy of the molecules increasing?

- A CD and DE
- B AB and CD
- C DE and EF
- D BC and CD

- 38** Woo Suk Hwang is a South Korean biomedical scientist who became famous for reporting a series of remarkable breakthroughs in the field of stem cell research. He claimed to have created human embryonic stem cells by cloning.

Read this paragraph from The New York Times, 2006, and answer the following question.

Dr. Hwang Woo Suk, the South Korean researcher who claimed to have cloned human cells, fabricated evidence for all of that research, according to a report released today by a Seoul National University panel investigating his work. The finding strips any possibility of legitimate achievement in human cell cloning from a researcher who had been propelled to international celebrity and whose promise to make paralyzed people walk had been engraved on a Korean postage stamp. In his string of splashy papers, his one legitimate claim was to have cloned the dog he named Snuppy. “Dr. Hwang’s team cannot avoid taking grave responsibility for fabricating its papers and concealing data,” said Chung Myunghye, the head of the university’s investigatory panel. Last month the panel said there was no evidence to support Dr. Hwang’s claim of June 2005 to have cloned cells from 11 patients with an efficient new technique using very few human eggs.

Which of the following is **unlikely** to be a motive as to why Hwang produced fraudulent stem cell research?

- A The fraudulent research helped delay real research into an immoral field.
- B He would gain academic prestige by accomplishing what others had not.
- C He could gain personal wealth from the patents he would receive.
- D He hoped to bring more research to his laboratory.



**39** Use the table below to answer the following question.

**Distance vs. Time**

<b>Time (seconds)</b>	<b>Distance (meters)</b>
0	0
1	2
2	8
3	18
4	32
5	50
6	72
7	98
8	128
9	162
10	200

Select the graph that would **best** represent the data and describe the relationship between the variables.

- A Histogram demonstrating momentum.
- B Line graph demonstrating velocity.
- C Frequency chart demonstrating force.
- D Bar graph demonstrating acceleration.

**40** All of the following can be found in a scientist’s notebook. Which of these is considered data?

- A Measurement recorded during an experiment.
- B Signature and date on every page.
- C List of possible questions that could be investigated.
- D Possible answer to a question posed by the scientist.

**41** Consumptive practices refer to

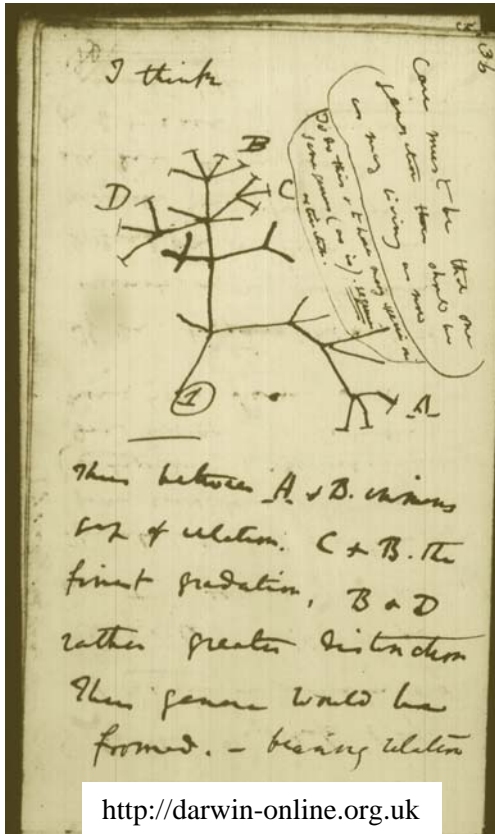
- A cost of resources among various societal groups.
- B use of another country’s resources.
- C use of clothing and reference materials by a society.
- D how much and what types of resources are used by a society.

**42** The Big Bang Theory not only helps scientists understand the origins of the universe, but also understanding of how

- A planets in our solar system formed.
- B momentum is conserved in open systems.
- C atomic elements are created.
- D living organisms appeared on our planet.



**43** The following diagram is from one of Charles Darwin's notebooks.



The words “I think” can be seen at the top of the page and a branching diagram is shown below that. The words “I think” represent a permanent documentation of one of Darwin’s

- A questions.
- B laws.
- C observations.
- D hypotheses.

**44** Pellagra is a disease that first appeared in the United States in the 1820’s and was known as the disease of the four Ds: dermatitis, diarrhea, dementia, and death. There was a debate among scientists whether pellagra was caused by poor diet or an infectious agent. Which of the following supports the fact that pellagra was caused by a poor diet?

- A Pellagra was not common in sailors, especially sailors that crossed the Atlantic Ocean.
- B Pellagra was common in the North, especially in universities and business offices.
- C Staff at institutions such as hospitals, prison, and orphanages did not develop Pellagra.
- D Orphans provided with fresh vegetables, meat, and milk recovered from Pellagra or never got it.

**45** A student is designing a science fair project to test the relationship between the rate of a chemical reaction and different factors such as changing the temperature, pH, and size of the reactant materials. He decides to test the hypothesis: rate of reaction increases when the temperature of the reaction is increased. In his experimental design, he heats his reaction and increases the acidity of the solution. Which of the following is correct?

- A He could improve the experimental design by grinding the reactants.
- B He has identified his control for the investigation.
- C He has a correct hypothesis in relation to the experimental design.
- D He is testing two variables at the same time.

**46** Which is considered a non-sustainable environmental practice?

- A Burning fossil fuels
- B Using solar energy
- C Recycling glass
- D Consuming vegetables

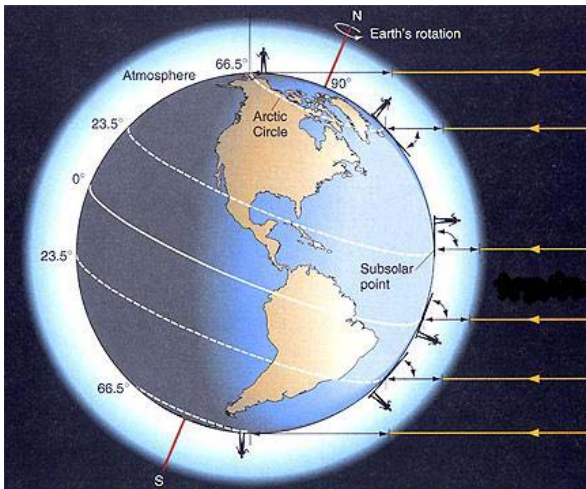
**47** Archeologists have evidence that the southwest region of the United States had a 40-year drought about a thousand years ago. Most native people moved away from the area. What is the **best** reason why these people abandoned their communities?

- A Large mammals migrated into the area.
- B Air temperatures increased in the region.
- C Soil characteristics changed causing drought.
- D Resources they needed for survival diminished.

**48** Which statement **best** describes how new scientific understandings become accepted.

- A When a change in knowledge occurs because new observations challenge prevailing theories.
- B A group of scientists come to common agreement about an idea at the same time.
- C New ideas become a theory as hypotheses are proven to be correct.
- D When a theory of the natural world gains so much support that it becomes a scientific law.

- 49** Use the diagram below to answer the following question.



[http://rst.gsfc.nasa.gov/Sect14/Sect14\\_1a.html](http://rst.gsfc.nasa.gov/Sect14/Sect14_1a.html)

Which of the following is **not** a contributing factor to the uneven warming of Earth's surface?

- A Different surfaces warm at different rates.
- B The Sun's rays hit the surface at different angles.
- C The Sun is farther from Earth during the winter.
- D Different surfaces retain energy differently.

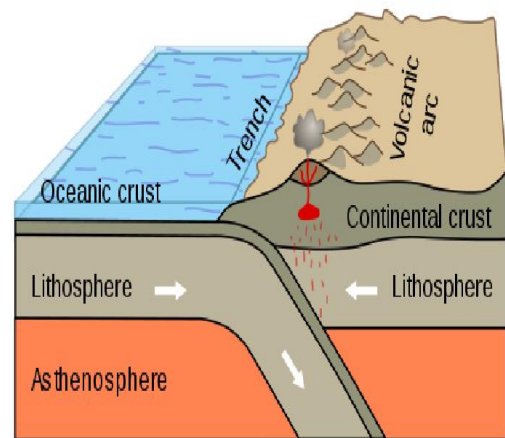
- 50** During its lifetime a star's absolute brightness

- A steadily increases.
- B remains constant.
- C steadily decreases.
- D fluctuates.

- 51** In a main sequence star, equilibrium is reached when matter pulled inward by the gravitational force is pushed outward by

- A convection of stellar material from the core.
- B coronal mass ejections originating from the chromosphere.
- C endothermic cooling of hydrogen fuel in the core.
- D radiation pressure created by forces in the core.

- 52** Use the diagram below to answer the following question.

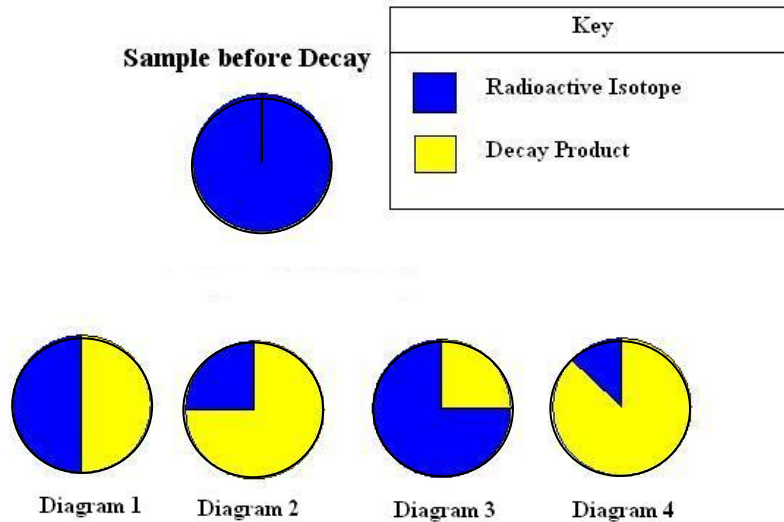


<http://geomaps.wr.usgs.gov/parks/pltec/contvsocn288x157.gif>

Which type of plate boundary is shown in the diagram?

- A Convergent
- B Divergent
- C Transform
- D Universal

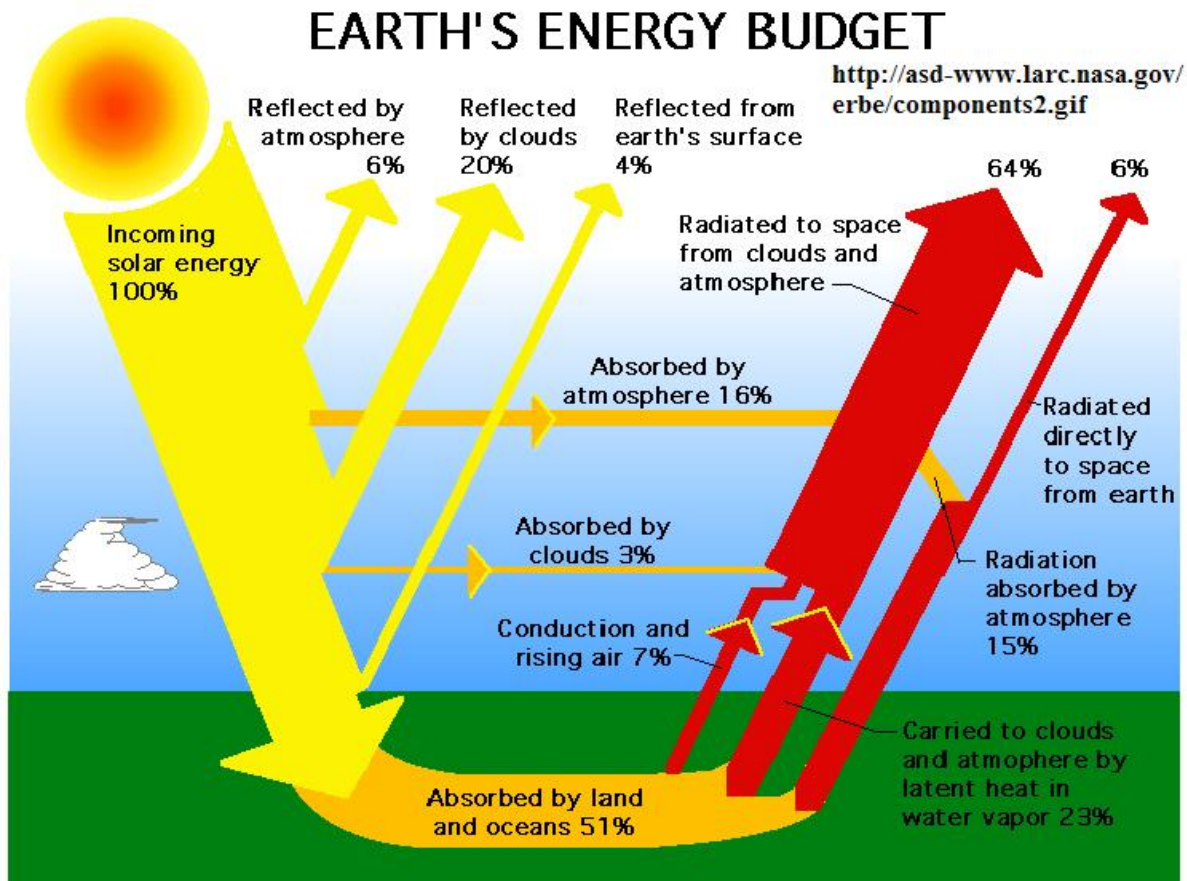
**53** Use the diagram below to answer the following question.



Which diagram **best** represents the percentage of this radioactive isotope sample that will remain after 2 half-lives?

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

**54** Use the diagram below to answer the following question. The diagram demonstrates the interaction of incoming solar radiation with the atmosphere.



<http://asd-www.larc.nasa.gov/erbe/components2.gif>

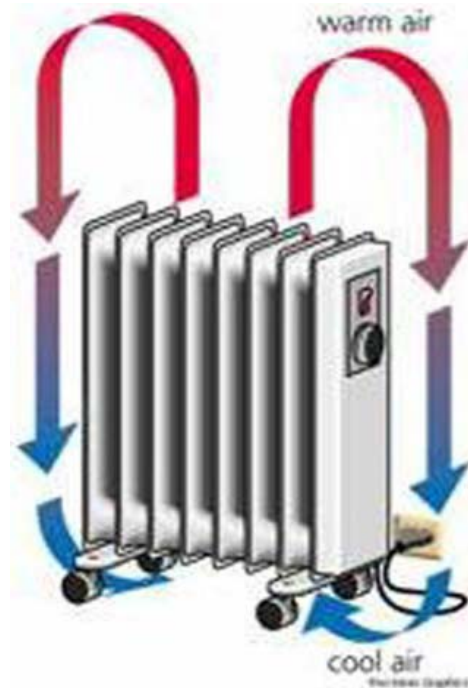
What would happen to the solar energy that reaches Earth if the ground was covered with snow? More solar radiation would be

- A reflected by the surface.
- B absorbed by the surface.
- C conducted by the surface.
- D converted to latent heat.

**55** Cyanobacteria, a type of photosynthetic bacteria, first appeared in Earth's oceans over 2 billion years ago, and were extremely abundant by 545 million years ago. Cyanobacteria affected Earth's atmosphere by

- A gradually adding to the amount of oxygen in the atmosphere.
- B progressively using up the nitrogen in the atmosphere.
- C slowly consuming all the ozone from the atmosphere.
- D rapidly increasing carbon dioxide levels in the atmosphere.

**56** Use the diagram below to answer the following question.



<http://www.answers.com/topics/convection>

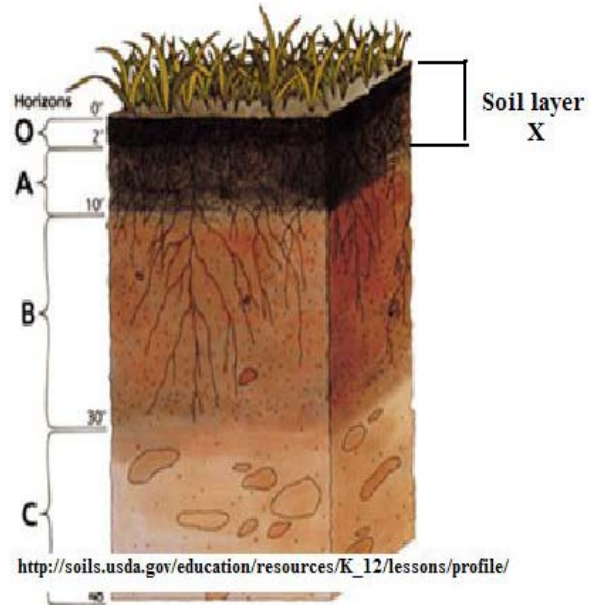
The flow of air around this heater is a useful comparison to how air flows in convection cells within Earth's atmosphere. This diagram demonstrates each of the following **except**

- A air blows laterally along Earth's surface and converges between adjacent cells.
- B cooled air descends within the atmosphere.
- C heated air ascends within the atmosphere.
- D air blows laterally in the upper atmosphere and converges between adjacent cells.

- 57** What can we conclude from the observation that most galaxies are moving away from us?
- A The once smaller universe is expanding in all directions.
  - B The Sun and Earth are located at the center of the universe.
  - C Everything in the universe is moving in the same direction.
  - D Massive black holes are drawing galaxies away from Earth.

- 58** Which of the following proposed telescopes would provide the **best** observations of distant astronomical objects?
- A An ultraviolet telescope located in Death Valley.
  - B An X-ray telescope in orbit around Earth.
  - C An infrared telescope at a Las Vegas observatory.
  - D A gamma ray telescope on Boundary Peak.

- 59** Use the diagram below to answer the following question. The cross section shows layers of soil.



Which change would **most likely** cause soil layer X to increase in thickness?

- A Increase in biologic activity
  - B Decrease in rainfall
  - C Decrease in temperature
  - D Increase in air pressure
- 60** Carbon cycles through Earth's atmosphere, biosphere, hydrosphere, and lithosphere. Once carbon is trapped in the lithosphere, it can be released directly into the atmosphere through
- A carbon fixing bacteria.
  - B evaporation.
  - C volcanic eruptions.
  - D physical weathering of rock.