Round 2

Regulation

(Tossup 1)   This material's pigment is determined by the agouti gene. Cells named for this material move with the basilar membrane in the inner ear. It's not nails, but the separation of disulfide bonds in cysteine-rich keratin is the reason burning this material smells bad. This material grows from follicles in the skin. For the point, name this material, unique to mammals, which typically grows on the head.

ANSWER: **hair** (accept **fur**)

(Tossup 2)   Urbain Le Verrier computed the orbit of this object, but it was discovered by Johann Galle [galuh] in 1846. Discovered in 1989, the Great Dark Spot discovered on this planet had disappeared by 1994. One moon which orbits this planet is noted for its cryo-volcanoes and retrograde orbit, indicating it might have been a Kuiper [ky-per] Belt object, that moon being Triton. The reclassification of Pluto resulted in, for the point, what planet becoming the outermost planet in the solar system?

ANSWER: **Neptune**

(Tossup 3)   In many desert species, the CAM pathway assimilates this compound at night. The most abundant enzyme on Earth, rubisco, binds to this compound in the first step of the Calvin cycle. Stomata open to let this gas enter leaves, while its storage by ancient plants is reversed when coal is burned. For the point, name this three-atom gas taken in by plants during photosynthesis that is converted to the sugar glucose.

ANSWER: **carbon dioxide** (accept **CO2**)

(Tossup 4)   In the game surrounding the Collatz conjecture, if the previous term does *not* have this property the next term will be equal to three times the previous term plus one. Goldbach's conjecture proposes that every number with this property can be written as the sum of two primes. Functions described by this property are symmetric over the y-axis. Only one prime number has this property. For the point, name these numbers divisible by two.

ANSWER: **even** numbers

(Tossup 5)   These organisms use choanocytes to move food past microvilli, which absorb nutrients in the process of filter-feeding. The bodies of these organisms contain a gelatinous matrix called a mesohyl. These organisms lack symmetry and internal organs. For the point, name this phylum of simple sessile, aquatic organisms.

ANSWER: **Sponges** (accept **Porifera**)

(Tossup 6) This molecule is released in the formation of a peptide bond. Desiccants made up silica gel and other material are used to absorb this molecule. The most common form of thin-film interference involves oil and this molecule. This molecule has a bent geometry, a freezing point at 0 degrees Celsius, and a boiling point at 100 degrees Celsius. For the point, name this substance with chemical formula H2O [h-two-oh].

ANSWER: **water** (accept **H2O** before it is read)

(Tossup 7) The difference between this quantity's forward and reverse forms equals the reaction heat. On a reaction coordinate, this quantity is the difference between the maximum point and the curve's value for the reactants. Catalysts lower, for the point, what amount of energy which must be supplied to a system for a reaction to occur?

ANSWER: **activation** energy [accept **Ea**; accept **activation** enthalpy)

(Tossup 8) This quantity is the analog of the work function for a single atom. Mulliken's electronegativity calculation is equal to the average of this quantity and electron affinity. This quantity is similar to electron affinity and decreases as one moves to the bottom left of the periodic table. For the point, name this quantity equal to the amount of energy required to strip an element of one electron to create a charged species.

ANSWER: first **ionization energy**

(Tossup 9) To prevent excessive energy loss through heat, the current in electrical lines is typically lowered while this quantity across the line is raised. Also defined as electromotive force or electric potential difference, for the point, identify this quantity which is often about 1.5 in standard metric units for double-A, triple-A, C, and D batteries, but is often about 9 for rectangular prism shaped batteries.

ANSWER: **voltage** (accept **electromotive force**; accept **electric potential difference**, do not accept or prompt on volt)

(Tossup 10) Quasars may be highly energetic parts of these objects. The Hubble Ultra-Deep Field image captured a picture with roughly 10,000 of these objects. Lenticular [len-tik-yu-ler] types of these objects have properties intermediate between elliptical and spiral types of these objects. For the point, identify these objects which include the dwarf Magellanic Clouds, the large Andromeda, and our own Milky Way.

ANSWER: **Galaxy** (accept **galaxies**)

(Tossup 11) An alloy of this element with lead is frequently used in manufacturing car batteries. A namesake exchanger uses sodium to remove this element from cells, the presence of which allows for the contraction of muscles. Though it's not magnesium, this element is one of the primary components of hard water. The carbonate of this element is used in antacid medication and found in limestone. For the point, name this element essential for the function of teeth and bones with symbol Ca.

ANSWER: **calcium** (accept **Ca** before it is read)

(Tossup 12) Carnelian, Citrine, [sit-reen] Jasper, and Agate are varieties of this mineral. The violet-purple variety of this mineral is amethyst. This mineral has piezoelectric properties, and was the basis of the many clocks and watches in the mid-20th century. This mineral's basic chemical formula is silicon dioxide. For the point, identify this mineral, which except for feldspar, is the most common mineral in Earth's crust.

ANSWER: **Quartz**

(Tossup 13) The derivative of this number to the x power is still this number to the x power. This value is the base of the exponential term used to calculate continuously compounding interest. This value raised to the product of pi and i equals -1, and it is approximated as 2.718. For the point, name this number, the base of the natural logarithm.

ANSWER: **e** (accept **Euler's constant**)

(Tossup 14) This process comes in "acid-base" and "redox" varieties. For poly-protic acids, the curve plotted from this process will have multiple inflection points. Phenolphthalein [fee-nahl-fay-leen] can be used as an indicator in this process. Burettes with stop cocks to control the flow into the flask are typically used in this process. For the point, name this process of slowly adding a titrant to a solution of unknown concentration.

ANSWER: **titration**

(Tossup 15) The oldest of these structures still in operation is Quatinah [kah-tee-nah] Barrage which, around 1300 BC, created Lake Homs in Syria. One type of these is a "gravity" type in which the force of gravity on this structure acts as a counterbalance to other forces, while those forces can be further balanced by adding an arch design to these structures. For the point, identify these structures, of which the Nurek in Tajikistan is the tallest, the Aswan High has the largest capacity, and among hydroelectric types, the Three Gorges in China produces the most electricity.

ANSWER: **dam**s

(Tossup 16) Defined as the amount of energy needed to raise the temperature of one kilogram of water by one degree Celsius, this quantity is approximately equal to four-point-two joules. A gram of protein or a gram of carbohydrates has a value of four for this quantity, but a gram of fat has a value of nine. For the point, name this unit of energy often found at the top of nutrition labels.

ANSWER: **calorie**s; accept kilo**calorie**s; accept food **calorie**s; accept small or large **calorie**s)

(Tossup 17) This substance emulsifies fat droplets when it is released into the duodenum of the small intestine from its namesake duct. This substance, which contains 0.2% bilirubin, is stored in the gallbladder. Bilirubin is partially responsible for the yellow-brown color of this digestive fluid. For the point, name this fluid produced by the liver that aids in the digestion of lipids.

ANSWER: **bile** (accept **gall** before gallbladder is read)

(Tossup 18) This process is inhibited by the hormone somatostatin. Once the epiphyseal plate closes, this process likely ceases forever. The pineal gland releases GH to stimulate this process which occurs mostly during sleep. Steroids can cause this process in muscles. For the point, name this process that is stunted in people with dwarfism.

ANSWER: **growth** (or **growing**; accept word-forms and synonyms; accept muscle **growth**; do not accept other forms of tissue growth)

(Tossup 19) Denial of the loss of this sense is known as Anton-Babinski syndrome. Arthropods use ommatidia for this sense. This sense is controlled by the second cranial nerve and can deteriorate due to macular degeneration. It is facilitated by rod and cone cells and can go cloudy for people with cataracts. For the point, name this sense processed by the retina in the back of the eye.

ANSWER: **sight** (accept synonyms and word forms)

(Tossup 20) Sums of numbers in this object can be calculated with the hockey stick identity. By coloring odd numbers in this object black, and even numbers white, one can create a fractal named for Sierpinski. The sums of the rows of this object are powers of two and each number in this object is a binomial coefficient. For the point, name this array of numbers named for a French mathematician in which each is the sum of the two above it.

ANSWER: **Pascal's triangle**

(Tossup 21) Precursors to this technology were developed by the Advanced Research Projects Agency of the United States Department of Defense. The IETF is responsible for maintaining the standards of this technology. ISPs provide this technology that Al Gore once called an "information super highway." For the point, name this system of interconnected computer networks that allows people to browse the web.

ANSWER: the **Internet** (accept **interconnected network**; prompt on world wide web; prompt on web)

(Tossup 22) The Buchner [bookh-ner] variety of this piece of lab equipment has a hose barb projecting from its neck which can be used to attach a vacuum. The Florence variety of this lab equipment requires a base to rest on since it is round bottomed. One of the more common types of this lab equipment is flat bottomed and conically shaped. For the point, identify these pieces of glassware used for holding or mixing chemicals, the most famous variety of which is named for its inventor, Emil Erlenmeyer.

ANSWER: Laboratory **flask**s

(Tossup 23) This scientist helped disprove spontaneous generation by using a swan-necked flask filled with broth. This scientist developed vaccines for rabies and anthrax. He is best known for his work on heating wines which was extended into his namesake process which increases the shelf life of perishable foods by heating them up. For the point, name this French scientist who names a process of treating milk to remove microorganisms.

ANSWER: Louis **Pasteur** (accept **Pasteur**ization)

(Tossup 24) The endoplasmic reticulum uses translocons to synthesize proteins that will be placed across this structure. The motility of this structure is controlled by cholesterol and fatty acid tail length. This structure is described by the "fluid-mosaic" model and consists of proteins embedded in a phospholipid bilayer. For the point, name this semi-permeable membrane that surrounds the cell's cytoplasm.

ANSWER: **cell membrane** (prompt on phospholipid bilayer; do not accept or prompt on cell wall)

(Tossup 25) Jelly-filled canals in these animals serve as electric field sensors and are called the Ampullae of Lorenzini. These animals have a cartilaginous skeleton, and they must continue to swim due to a lack of swim bladder to keep them afloat. These animals, noted for regenerating teeth, include the extinct Megalodon. For the point, name these animals whose varieties include tiger, hammerhead, and great white.

ANSWER: **shark**s (accept **selachimorpha**)

(Tossup 26) John Flamsteed thought this object was a new star when he first observed it, and William Herschel first believed that this object was a comet. One theory suggests that this object was struck by a large object early in its existence which not only caused this object to lose a great deal of its internal heat, but also caused this object to tilt so that its axis is very close to being parallel to the plane of the solar system. For the point, identify this planet which has moons that include Titania and Ariel, the 7th planet from the sun.

ANSWER: **Uranus**

(Tossup 27) Early detectors of this type of radiation drew their power from the radiation as it was modulated by a small diode made of crystalline galena. Unlike higher frequencies, very low frequencies of this radiation can travel underwater for long distances. For the point, identify this type of radiation, first generated artificially by Heinrich Hertz, and which consist of electromagnetic waves with frequencies under 3 billion hertz and are used for radar and communications.

ANSWER: **radio** waves

(Tossup 28) Transport across this organelle's basket shaped pore complexes is facilitated by exportins and importins which move proteins with an NLS signal to the inside of this organelle. This organelle has a double-membrane and is broken down at the beginning of mitosis. DNA polymerases are found in this organelle. For the point, name this organelle that contains the nucleolus and houses the cell's DNA.

ANSWER: **nucleus**

(Tossup 29) Electrolysis of water forms oxygen gas and this element's gas, and a type of bond named for this element causes compounds to have a higher boiling point because of intermolecular forces. One of its isotopes is deuterium, and this element's ion is equivalent to a proton. For the point, name this first and lightest element on the periodic table with symbol H.

ANSWER: **hydrogen** (accept **H** before it is read)

(Tossup 30) One of these features, named for the Philippines, runs 1320 kilometers from Luzon to Halmahera. One of these features named for Puerto Rico runs about 800 kilometers and marks part of the boundary between the Atlantic and Caribbean. These features appear at convergent plate boundaries and mark the location where one plate subducts beneath another. For the point, identify these submarine features, the most famous of which is located off the coast of the Mariana Islands and bottoms out at Challenger Deep.

ANSWER: Oceanic **trench**es (accept submarine **trench**)

Replacements

(Tossup 31) The origin of this taxon is thought to have occurred due to endosymbiosis. The flagella of members of this taxon have a nine plus two arrangement. The Latin name of this domain is "true kernel." Organisms in this domain can undergo meiosis to produce four haploid daughter cells, and this domain is characterized by organelles and a nucleus. For the point, name this domain of life consisting of plants and animals.

ANSWER: **Eukaryote**s (accept **Eukaryota**)

(Tossup 32) The father of modern taxonomy, Carl Linnaeus, was also known for inverting a scale used to measure this quantity. This quantity was measured in units by William Thomson, who was the 1st Baron Kelvin. For 10 points, what quantity was also measured by Anders Celsius and Daniel Gabriel Fahrenheit?

ANSWER: **temperature** (prompt on heat)