

Finals Elementary

Finals Tossups

(1) **Many members of this order contain a structure called a melon, which houses the spermaceti [[sper-mah-SEH-tee]] organ. Filter-feeding members of this order possess keratin plates called (+) baleen [[BAY-leen]]. Members of this order breathe through a specialized nostril on their backs called a (*) blowhole.** For the point, name this order of marine mammals that includes porpoises, dolphins, and whales.

ANSWER: **Cetaceans** [[see-TAY-shuns]] (accept **Whales** before mentioned; prompt on "dolphin" or "porpoise" before mentioned)

(2) **These periods involve paradigm shifts as described in Thomas Kuhn's [[KYOONS]] *The Structure of [this sort of period]*. Along with the Renaissance, one of these periods is held to have not been a radical break from the Middle Ages in the "continuity thesis." The (+) publication of Copernicus's theories is considered the beginning of (*)** one of, for the point, what type of social era, which included the development of modern biology and chemistry?

ANSWER: **Scientific Revolutions** (prompt on "Copernican Revolution")

(3) **For an ideal block and tackle setup, this quantity is equal to the number of rope sections supporting the block. For a wedge, this quantity is inversely proportional to the wedge's slope. This quantity (+) is demonstrated by the law of the lever, which relates opposing weights and arm length. Used to measure the effectiveness of simple (*)** machines, for the point, what is this output force to input force?

ANSWER: **Mechanical Advantage**

(4) **Chiral [[KY-rull]] symmetry breaking and asymptotic [[AY-simp-TAH-tik]] freedom are among the properties of the quantum chromodynamics theory of this force, which confines smaller particles into hadrons. This force, whose magnitude (+) increases with distance, is mediated by gluons. Binding together neutrons and protons in the (*)** nucleus, for the point, what is this fundamental force which is much more powerful than the weak force?

ANSWER: **Strong Nuclear Force** (or **Strong** Interaction; or **Color** Force; prompt on "quantum chromodynamics" before mentioned)

(5) **These phenomena were less frequent during the Spörer and Maunder Minima. The position of these phenomena predicts the location of coronal loops and solar (+) flares. The frequency of these phenomena varies on an eleven-year cycle which corresponds to the reversal of a magnetic field. Found on the surface of the (*) sun, for the point, what are these temporary darker regions sometimes visible from Earth without a telescope?**

ANSWER: **Sunspots**

(6) **In his book *How to Live Longer and Feel Better*, this scientist advocated taking megadoses of vitamin C to prevent the common cold. This scientist outlined the modern understanding of an atom's tendency to attract (+) shared electrons in his book *The Nature of the Chemical Bond*. The Nobel Prize in Peace and Chemistry (*) were given to, for the point, what American scientist?**

ANSWER: Linus **Pauling** (or Linus Carl **Pauling**)

(7) **Due to having temperatures near the surface of the sun, this region passes the Curie temperature and is not ferromagnetic. This layer, whose existence is demonstrated by (+) PKiKP waves, is composed of a solid iron-nickel alloy. The liquid outer core (*) surrounds, for the point, what solid metal layer of the Earth?**

ANSWER: **Inner Core** (prompt on "core"; do not accept or prompt on "outer core")

(8) **This scientist discovered the elements cesium [[SEE-zee-um]] and rubidium [[roo-BIH-dee-um]] with Gustav Kirchhoff [[KEER-kof]]. This scientist lends his name to a device that manipulates airflow at the (+) top and fuel supply at the bottom to control combustion rate. A common type of open-flame (*) burner is named for, for the point, what German chemist?**

ANSWER: Robert **Bunsen** (or Robert Wilhelm Eberhard **Bunsen**; accept **Bunsen** Burner)

(9) **For an object to be in static equilibrium, this force's metacenter must be above the center of gravity. This force, which equals density times gravity times volume, is opposed by the hydrostatic pressure gradient. This force equals the weight of the (+) fluid that is displaced according to the Archimedes principle. Objects float in liquid (*) due to, for the point, what force?**

ANSWER: **Buoyant** force (or **Buoyancy**; accept **Upthrust**)

(10) **In their simplest form, these devices possess a vertical portion, the gnomon [[NOH-mon]], and a horizontal portion, the style. Along with specialized candles and water (+) drip clocks, these were among the earliest devices to mark the time of day. The position of shadows is (*) used in, for the point, what devices that determine the time?**

ANSWER: **Sundial**

(11) **Large circular holes in these objects are called moulins [[MOO-lins]]. Deposits created by these objects include eskers and drumlins. Cirques [[SIRKS]], fiords (+), and moraines were created by the retreat of these objects which break down at the coast via calving [[KAV-ing]], forming (*) icebergs. Greenland and Antarctica are covered in, for the point, what massive ice formations?**

ANSWER: **Glaciers** (prompt on "glacial lake")

(12) **Patients who fail to develop this structure may develop Probst bundles to compensate. Damage to this structure can result in alien hand syndrome or Dr. Strangelove syndrome. This structure has a Latin name meaning "tough (+) body." This structure is severed in patients who undergo a split brain procedure, which is sometimes used to treat epilepsy. The two hemispheres (*) of the brain are linked by, for the point, what structure?**

ANSWER: **Corpus Callosum** (or **Callosal Commissure**)

(13) **These objects can form when an empty cavity, such as a gas bubble, is filled with groundwater that deposits crystalline minerals. These (+) objects are smaller analogs to vugs and crystal caves. Coming from the Greek word for "Earth-Like," (*) for the point, what are these hollow rocks containing crystals?**

ANSWER: **Geode**

(14) **A type of scattering found in these substances can give a blue appearance to motorcycle smoke or flour mixed into water. These substances, which exhibit the Tyndall effect, include emulsions and aerosols. (+) Common examples of these substances include milk, fog, and foam. Insoluble particles are suspended (*) within another in, for the point, what type of mixture?**

ANSWER: **Colloid** (accept **Colloidal Suspension**; prompt on "suspension")

(15) **One sessile [[SESS-ile]] clade [[KLAYD]] in this phylum has a symbiotic relationship with clownfish, providing shelter in exchange for cleaning. This (+) phylum is characterized by a specialized type of cell that releases stinging toxins on contact. Sea Anemone, (*) Jellies, and Coral are all a part of, for the point, which animal phylum?**

ANSWER: **Cnidarians** [{"nigh"- "DARE"-ee-uns}] (prompt on "Jellies"; be lenient on pronunciation)

(16) **A loop example of these materials is called a Josephson junction. Through the Meissner effect, these materials expel magnetic field lines. The BCS theory of these materials posits that phonons (+) mediate the binding of electrons into Cooper pairs. Lacking electrical (*) resistance, for the point, what are these materials with a "high temperature" variety?**

ANSWER: **Superconductor** (accept **Superconductivity**; prompt on "conductor")

(17) **When oxygen is present, this protein produces phosphoglycolate [[foss-foh-gly-KOH-"late"]] and 3-phosphoglycerate [{"three" foss-foh-GLIH-seh-"rate"}]. In C4 plants, this protein has reduced specificity and is located in the bundle (+) sheath cells. This protein is the most abundant enzyme on Earth and catalyzes the start of the Calvin cycle. The carboxylation of RuBP in photosynthesis (*) occurs due to, for the point, what major enzyme?**

ANSWER: **RuBisCO** [{"roo-BIH-skoh}] (or **RuBPCase**; or **RuBPCo**; accept **Ribulose-1,5-bisphosphate carboxylase/oxygenase**)

(18) **An autoclave uses "wet-heat" to leverage hydrolysis [{"high"-DRAH-lih-siss}] to perform this task on glassware, rendering it aseptic. 70 percent (+) is the most effective concentration of isopropyl [{"eye"-soh-PROH-pil}] alcohol for performing this task. The killing of microorganisms on lab (*) equipment and other surfaces is done through, for the point, what method?**

ANSWER: **Sterilization** (accept word forms and answers such as "making **sterile**"; accept answers indicating "killing microorganism" before mentioned; prompt on answers such as "cleaning")

(19) **When originally discovered, these objects were nicknamed "LGM," or little green men. One of these bodies in the Crab Nebula emits X-rays. These bodies are only detectable if one of their (+) poles points toward the Earth. Named for periodically emitting bursts of radio (*) waves, for the point, what are these rapidly rotating neutron stars?**

ANSWER: **Pulsar** (accept **Pulsating Radio** Source; prompt on "Little Green Men" or "LGM" before mentioned; prompt on "Neutron Star" before mentioned)

(20) **When this process occurs over a single geographic range, it is termed "sympatric." The allopatric type of this process occurs due to geographic (+) isolation, and new branches on phylogenetic [[FY-loh-"genetic"]] trees are formed by this process. The inability of two populations of organisms to (*) breed is caused by, for the point, what ecological process?**

ANSWER: **Speciation** (accept Centrifugal **Speciation**; accept Sympatric **Speciation**; accept Allopatric **Speciation**; accept Peripatric **Speciation**; accept Parapatric **Speciation**; prompt on "Evolution")

(21) **Torque is equal to the moment of inertia multiplied by the tangential form of this quantity. In general relativity, it is impossible to distinguish between (+) forces caused by gravity and this quantity. Often measured in units per (*) meter squared, for the point, what is this quantity measuring rate of change in velocity?**

ANSWER: **Acceleration** (accept Centripetal **acceleration**; accept Tangential **acceleration**)

(22) **The cantilevered type of these objects are supported only from one end. One common type of these objects has two horizontal flanges [[FLAN-jeez]] connected by a vertical (+) web, known as the "I" type of these objects. Having much greater length (*) than width, for the point, what are these fundamental structural components?**

ANSWER: **Beam** (accept Cantilevered **beam**; accept I-**beam**)

(23) **One algorithm for this task that uses paired comparisons is named after garden gnomes. Exchange-based algorithms for this task have a worst-case runtime of "Big O [[OH]] of n (+) squared." Common algorithms like bubble, quick, and merge (*) name types of, for the point, what task of organizing an array or list into a desired order?**

ANSWER: **Sorting** (or **Sorting** algorithm; accept Bogo, Gnome, Exchange, Bubble, Quick, or Merge **Sort**)

(24) **This man's proof of the fundamental theorem of algebra was created to refute D'Alembert's [[dah-lem-BEHRs]] false proof. This man names a theorem relating the electric field to the charge (+) distribution, and this man also names a distribution shaped like a bell curve. The Normal Distribution (*) is named for, for the point, what German mathematician?**

ANSWER: Johann Carl Friedrich **Gauss** (accept **Gaussian** curve or curvature; accept **Gauss**'s law or flux theorem; accept **Gaussian** distribution or **Gauss**'s distribution; accept Laplace-**Gauss** distribution)

(25) **This constellation contains a notable binary system made of Mizar ["MY"-zar] and Alcor. Major stars in this constellation include Dubhe [[DOO-beh] and (+) Merak [[MEE-rak], which can be used to locate Polaris in another constellation. The (*) "Big Dipper" is found in, for the point, what northern hemisphere constellation?**

ANSWER: **Ursa Major** (or **Great Bear**; accept **Ursa Major** Moving Group or **Ursa Major** Association; prompt on the "Big Dipper" before read; prompt on "the Plough")

Extra Questions

(1) **Along with placozoa [[play-koh-ZOH-ah]], this is the only animal phylum to lack true, differentiated tissues. This phylum is usually (+) considered to be the most basal animal lineage, making it the sister taxon to all other (*) animals.** For the point, name this simple animal phylum, which contains sponges.

ANSWER: **Porifera** (prompt on "sponges" before mentioned)

(2) **Due to this phenomenon, changes in wind velocity can cause a hook echo on weather radar. This phenomenon's namesake radar is used by police (+) radar guns to determine a car's velocity. This phenomenon is visualized with the bunching of waves in front of a moving source. (*)** Redshift is caused by, for the point, what phenomenon in which a pitch shifts with movement, as with a siren driving by?

ANSWER: **Doppler** effect (or **Doppler** shift; accept **Doppler** radar; prompt on "red shift" or "blue shift" before mentioned)