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Science Bowl

Science Bowl Questions #3: 25 Biology Toss-ups and Bonuses

1. Toss-up: Biology: Multiple Choice: Additional evidence for DNA as the genetic material came from studies of viruses that infect bacteria, coined which of the following terms?

W. virulent bacteria

X. virophages

Y. bacteriophages

Z. bacterial viruses

ANSWER: Y

Bonus: Biology: Multiple Choice: A phage that reproduces only by the lytic cycle, where the host cell is lysed, or broken, when the viruses escape, is called which of the following?

W. temperate phage

X. lytic phage

Y. prophage

Z. virulent phage

ANSWER: Z

1. Toss-up: Biology: Multiple Choice: A species may originate from an accident during cell division that results in extra sets of chromosomes, a condition called what?

W. polyploidy

X. pleiotropy

Y. epistasis

Z. polystasis

ANSWER: W

Bonus: Biology: Multiple Choice: What is the name of the model, supported by a range of evidence, that states that mitochondria and plastids were formerly small prokaryotes that began living within larger cells?

W. theory of natural selection

X. Koch's postulates

Y. endosymbiotic theory

Z. homeotic theory

ANSWER: Y

1. Toss-up: Biology: Multiple Choice: Which of the following is an apicomplexan protist responsible for malaria, having an intricate life cycle with both sexual and asexual stages?

W. Paramecium caudatum

X. Plasmodium falciparum

Y. Trypanosoma brucei

Z. Naegleria fowleri

ANSWER: X

Bonus: Biology: Short Answer: Name the disease caused by the protist Trypanosoma brucei that is prevalent in Africa, transmitted by the tsetse fly, and can cause confusion, reduced coordination, mid-day fatigue, and eventual coma and death.

ANSWER: African Sleeping Sickness

1. Toss-up: Biology: Multiple Choice: In mammals, these glands, a set of four small structures embedded in the posterior surface of the thyroid, plays a major role in blood calcium ion regulation.

W. Pituitary Gland

X. Adrenal Glands

Y. Post-thyroid Glands

Z. Parathyroid Glands

ANSWER: Z

Bonus: Biology: Short Answer: If blood calcium ion concentrations rise above a set point, the thyroid gland releases what hormone, which inhibits bone respiration and enhances calcium ion release by the kidney?

ANSWER: Calcitonin

1. Toss-up: Biology: Multiple Choice: In which of the following phases of mitotic cell division does the mitotic spindle begin to form, moving the centrosomes from each other after the chromatin fibers become more tightly coiled?

W. Prophase

X. Prometaphase

Y. Metaphase

Z. Anaphase

ANSWER: W

Bonus: Biology: Multiple Choice: What shallow groove in the cell surface near the old metaphase plate appears at the first sign of cleavage in cytokinesis?

W. Metaphase Furrow

X. Cleavage Furrow

Y. Kinetochore

Z. Cell Plate

ANSWER: X

1. Toss-up: Biology: Multiple Choice: What is the failure of a chromosome pair to separate during Meisois?

W. Karyotype

X. Amniocentesis

Y. Nondisjunction

Z. Trisomy

ANSWER: Y

Bonus: Biology: Short Answer: What woman scientist was given the Nobel prize in medicine at age 81 for discovering transposable elements in the genome of corn?

ANSWER: Barbara McClintock

1. Toss-up: Biology: Multiple Choice: A disaccharide, such as sucrose, is two monosaccharides joined by which of the following?

W. Hydrogen Bond

X. Peptide Bond

Y. Glycosidic Linkage

Z. A Disulfide Bond

ANSWER: Y

Bonus: Biology: Multiple Choice: In the polysaccharide amylose, the glucose units are joined by which of the following linkages?

W. α 1-4 linkages

X. α 1-6 linkages

Y. β 1-4 linkages

Z. β 1-6 linkages

ANSWER: W

1. Toss-up: Biology: Multiple Choice: Each rod or cone in the vertebrate retina contains visual pigments that consist of a light-absorbing molecule bound to a membrane protein called opsin. What is this molecule?

W. albumin

X. creatin

Y. glutamate

Z. retinal

ANSWER: Z

Bonus: Biology: Short Answer: The processing of visual information begins in the retina itself, where both rods and cones form synapses with neurons called what?

ANSWER: Bipolar cells

1. Toss-up: Biology: Multiple Choice: Which of the following animals has radial symmetry?

W. sea anemone

X. lobster

Y. squid

Z. earthworm

ANSWER: W

Bonus: Biology: Multiple Choice: In the phylogeny of amniotes, the ancestral amniote divided into reptiles and which of the following?

W. Birds

X. Amphibians

Y. Synapsids

Z. Fish

ANSWER: Y

1. Toss-up: Biology: Multiple Choice: What is the scientific name for placental mammals, which provide an intimate and long-lasting association between the mother and her developing young?

W. Monotremes

X. Marsupials

Y. Anthropods

Z. Eutherian

ANSWER: Z

Bonus: Biology: Multiple Choice: In the amniotic egg, which of the following organs is the disposal sac for certain metabolic wastes produced by the embryo, functioning with the chorion as a respiratory organ?

W. amnion

X. yolk sack

Y. albumen

Z. allantois

ANSWER: Z

1. Toss-up: Biology: Multiple Choice: What structural polysaccharide is considered the most abundant organic compound on Earth?

W. Cellulose

X. Chitin

Y. Amylose

Z. Amylopectin

ANSWER: W

Bonus: Biology: Short Answer: What important structural polysaccharide, used by arthropods to build their exoskeleton, is made from cellulose with an added nitrogen containing appendage?

ANSWER: Chitin

1. Toss-up: Biology: Multiple Choice: Which of the following terms refers to the changes in form of a plant that result from mechanical perturbation or any form of mechanical stimulation?  
   W. photomorphogenesis

X. thigmomorphogenesis

Y. abiotic morphogenesis

Z. mechanomorphogenesis

ANSWER: X

Bonus: Biology: Short Answer: What form of tropism is demonstrated by a horizontally oriented primary root of maize bending until its growing tip becomes vertically oriented downward?

ANSWER: gravitropism

1. Toss-up: Biology: Multiple Choice: Which of the following areas of the body would most likely have the largest amount of smooth muscle?

W. Heart

X. Femur

Y. Digestive Tract

Z. Brain

ANSWER: Y

Bonus: Biology: Short Answer: What part of a neuron, which are bundled together into nerves, transmits impulses towards another neuron or towards an effector?

ANSWER: Axon

1. Toss-up: Biology: Short Answer: The steady body temperature of a river otter and the stable concentration of solutes in a freshwater bass are examples of this biological phenomenon, which means "steady state", or internal balance.

ANSWER: homeostasis

Bonus: Biology: Multiple Choice: In many birds and mammals, reduction of heat loss relies on this phenomenon, the flow of adjacent fluids in opposing directions that maximizes transfer rates of heat or solutes.

W. integumentary system

X. endothermic response

Y. antiparallel heat conduction

Z. countercurrent exchange

ANSWER: Z

1. Toss-up: Biology: Multiple Choice: The minimum metabolic rate of a nongrowing edotherm that is at rest, has an empty stomach, and is not experiencing stress is called what?

W. normal metabolic rate

X. standard metabolic rate

Y. torporic metabolic rate

Z. basal metabolic rate

ANSWER: Z

Bonus: Biology: Short Answer: What is the name of a physiological state in which activity of an animal is low and metabolism decreases, an adaptation enabling animals to save energy while avoiding difficult and dangerous environmental conditions?

ANSWER: Torpor

1. Toss-up: Biology: Multiple Choice: In animal cells, microtubules grow outward from this organelle, a region that is often located near the nucleus.

W. nucleosome

X. tubulosome

Y. centrosome

Z. pseudopodia

ANSWER: Y

Bonus: Biology: Multiple Choice: In each centriole, two of which make up a centrosome, each outer doublet of microtubules has pairs of protruding motor proteins, which are activated by ATP, spaced along its length. What are these motor proteins?

W. ATPases

X. myosin

Y. actin

Z. dyneins

ANSWER: Z

1. Toss-up: Biology: Multiple Choice: Name the only 5-carbon intermediate in the Krebs cycle, produced by the action of Isocitrate Dehydrogenase (IDH) on isocitrate, the reduction of NAD+ into NADH, and the subsequent loss of a CO2 molecule.

W. Succinate

X. α-Ketoglutarate

Y. Fumarate

Z. Oxaloacetate

ANSWER: X

Bonus: Biology: Short Answer: Name the iron-containing prosthetic group present in many of the multiprotein cytochrome complexes in the electron transport chain that has the ability to bind oxygen and transfer electrons down an energy gradient.

ANSWER: heme

1. Toss-up: Biology: Multiple Choice: What is the final carbohydrate product of the Calvin cycle, also called the light-independent reactions of photosynthesis, in C3 plants?

W. Phosphoenolpyruvate

X. Ribulose bisphosphate

Y. Gylceraldehyde-3-phosphate

Z. Nicontinamide Adenine Dinucleotide Phosphate

ANSWER: Y

Bonus: Biology: Multiple Choice: Name the CO2 and O2 binding protein in the Calvin cycle, said to be the most abundant on Earth, that is a metabolic relic from a much earlier time when O2 concentrations were much lower.

ANSWER: Rubisco OR Ribulose Bisphosphate Carboxylase OR RuBP carboxylase

1. Toss-up: Biology: Multiple Choice: This messenger/signal-transduction molecule in the cell is created by adenylyl cyclase's action on ATP in response to an extracellular signal delivered by a G protein-coupled receptor.

W. GTP

X. ADP

Y. AMP

Z. cAMP

ANSWER: Z

Bonus: Biology: Short Answer: Name this metal ion, more widely used than cAMP as a cellular messenger in both G-protein and tyrosine kinase pathways, that is activated by increase in the concentrations of inositol triphosphate (IP3) and diacylglycerol (DAG) in the cell.

ANSWER: Ca2+

1. Toss-up: Biology: Multiple Choice: Lysosomes carry out intracellular digestion in a variety of circumustances. Amoebas and many other protists eat by engulfing smaller organisms or other food particles, a process creating a food vacuole, specifically called what?

W. lysosomic digestion

X. exocytosis

Y. endocytosis

Z. phagocytosis

ANSWER: Z

Bonus: Biology: Short Answer: Peroxisomes contain enzymes that transfer hydrogen from various substances to oxygen, generating what chemical as a byproduct?

ANSWER: H2O2 (hydrogen peroxide)

1. Toss-up: Biology: Short Answer: What is the name of so called "bad cholesterol", which is associated with the deposition of cholesterol in arterial plaque?

ANSWER: LDL (Low-density lipoprotein)

Bonus: Biology: Multiple Choice: If tissues in the body do not receive enough oxygen, the kidneys synthesize and secrete a hormone that stimulates the production of erythrocytes. What is this hormone?

W. insulin

X. glucagon

Y. erythropoietin

Z. Fibrin

ANSWER: Y

1. Toss-up: Biology: Multiple Choice: These large phagocytic cells of the immune system provide an effective phagocytic defense by residing permanently in various organs throughout the body.

W. Macrophages

X. Antigens

Y. T cells

Z. B cells

ANSWER: W

Bonus: Biology: Short Answer: The production of effector cells from a clone of lymphocytes during the first exposure to an antigen represents what immune response, peaking about 10 to 17 days after initial exposure?

ANSWER: Primary immune response

1. Toss-up: Biology: Multiple Choice: One of the most common neurotransmitters in both invertebrates and vertebrates is this chemical, which is released as an excitatory transmitter when verterbrate neurons from synapses with muscle cells.

W. dopamine

X. epinephrine

Y. acetylcholine

Z. serotonin

ANSWER: Y

Bonus: Biology: Short Answer: This neurotransmitter, an amino acid, appears at most inhibitory synapses in the brain and produces IPSPs by increasing the permeability of the postsynaptic membrane to the chloride ion, decreasing the chance of future action potentials.

ANSWER: GABA (γ-aminobutyric acid)

1. Toss-up: Biology: Short Answer: What are organisms that obtain energy by creating their own food called?

ANSWER: Autotrophs

Bonus: Biology: Short Answer: What two organelles of a bacterium are usually targeted by antibiotics such as ampicillin or chloramphenicol?

ANSWER: Cell Wall and Ribosome

1. Toss-up: Biology: Multiple Choice: Which of the following would be the method the human cell uses to take in cholesterol for the synthesis of membranes and other steroids?

W. Exocytosis

X. Receptor Mediated Endocytosis

Y. Phagocytosis

Z. Pinocytosis

ANSWER: X

Bonus: Biology: Short Answer: What is the name for a transport protein that transports substances against their electrochemical gradient and generates voltage across a membrane?

ANSWER: Electrogenic Pump