2022 MIT Science Bowl High School Invitational Tiebreak Round 5

TOSSUP

1) CHEMISTRY *Short Answer* Which of the following solvents is most suitable for an S_N2 reaction?

W) Methanol
X) Ethanol
Y) Diethyl ether
Z) Water

ANSWER: Y) Diethyl ether

TOSSUP

2) EARTH AND SPACE *Multiple Choice* Which of the following processes is responsible for producing spectral lines?

W) Compton scattering
X) Thomson scattering
Y) Bound-free absorption
Z) Bound-bound absorption

ANSWER: Z) Bound-bound absorption

TOSS UP

3) PHYSICS *Short Answer* By name or number, identify all of the following three quantities that are both conserved and universally invariant:

1) Charge
2) Linear momentum
3) Energy

ANSWER: 1 only

TOSS UP

4) BIOLOGY *Multiple Choice* Atropine (*A-truh-peen*) is used as a muscle relaxant because it acts as an antagonist for receptors of which neurotransmitter?

ANSWER: Acetylcholine

TOSS UP

5) MATH *Short Answer* What are the eigenvalues of the two by two matrix with first row 0, 2 and second row 2, 0?

ANSWER: 2 and -2
