2022 MIT Science Bowl High School Invitational Tiebreak Round 3

TOSSUP

1) CHEMISTRY *Multiple Choice* Which of the following spherically symmetric atomic orbitals has 3 radial nodes?

W) $1s$
X) $2s$
Y) $3s$
Z) $4s$

ANSWER: Z) $4s$

TOSS UP

2) EARTH AND SPACE *Short Answer* By name or number, rank the following 4 intrusive igneous rocks by increasing silica content:

1) Gabbro
2) Granite
3) Diorite (*DAI-uh-rite*)
4) Peridotite (*per-IH-duh-tite*)

ANSWER: 4, 1, 3, 2

TOSS UP

3) PHYSICS *Short Answer* Jeff rides an elevator up and down while standing on a scale. The elevator travels at the same speed going upwards and downwards, and it takes the same amount of time to accelerate in each instance. By name or number, identify all of the following three statements which are true about the weight shown on the scale:

1) The scale shows a larger weight when the elevator has a constant upward velocity than when it has a constant downward velocity
2) The scale shows a larger weight when the elevator is starting to go up than when it is coming to a stop on the way down
3) If the elevator cord snaps and the elevator falls down, the scale would show a larger value than when the elevator is at rest

ANSWER: None

TOSS UP

4) BIOLOGY *Short Answer* Depolarization during fertilization acts as a fast block for what process?

ANSWER: Polyspermy

TOSS UP

5) MATH *Multiple Choice* In simplest form, what is the reciprocal of the fraction with numerator $3i + 1$ and denominator 50?

W) $3i - 1$
X) $3i - 5$
Y) $15i - 1$
Z) $15i - 5$

ANSWER: Z) $15i - 5$
