



ASIA R O P E O L Y M P I A D

Science National Round Category 5 MOCK TEST

1. You have ninety (90) minutes to finish the test.
2. This test covers **Life Science**, **Physical Science**, and **Earth Science**.
3. There are thirty (30) Multiple-Choice Questions in this test. Each correctly answered question shall be marked three (3) points. No points shall be deducted for incorrect answers.
4. You must shade properly the ovals that correspond to the letters of your answers on the **ANSWER SHEET**.
5. You may draw illustrations or write your solutions on the **TEST BOOKLET**.
6. You are **NOT ALLOWED** to use any communication gadget during the test proper.
7. Any form of cheating is a ground for **DISQUALIFICATION**.
8. After the test, you must **SUBMIT** to the proctor both the **TEST BOOKLET** and the **ANSWER SHEET**.



PART I - LIFE SCIENCE

1. The diagram below shows the structures of the plant and animal cell. Which of the following inferences is inconsistent with the cell structures?

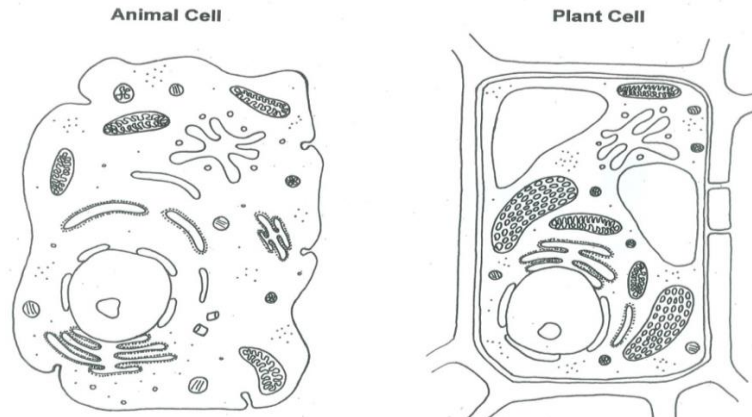


Figure 1. Structures of the plant and animal cells

- A. Both cell types have nucleus.
B. Plant cells can store water longer than animal cells.
C. Plant cells are more rigid and structurally tough.
D. Plant cells do not have mitochondria because they already have chloroplasts.
2. The diagram below shows an illustration of the molecules of the different phases of matter. Which of the following statements is/are **TRUE**?

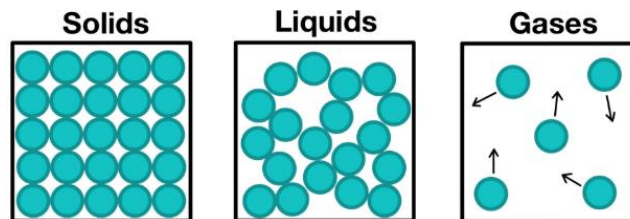


Figure 2. Molecules of the different phases of matter

- I. Energy is supplied to convert liquid substances to its gaseous state.
II. Gases have the lowest kinetic energy.
III. Heat is released during freezing.
IV. Solids have the least attraction between its molecules.

- A. I, II, and III only
B. I and III only

- C. I, II, and IV only
D. II, III only





3. The half-life of isotope X is 2.3 million years. What is the estimated age of a newly found rock containing 6.25% of its original isotope X mass?
- A. 3.68 million years
B. 143,750 years
C. 9.2 million years
D. 11.5 million years

4. Two facts about the veins and the arteries are stated below. Which of the following inferences is/are **TRUE**?

Fact 1: The veins collect deoxygenated blood from body organs.

Fact 2: Arteries have narrower opening than veins and they transport blood in pulses.

- I. Blood is transferred at a higher pressure in the arteries than in the veins.
II. Blood transferred in veins are darker in color.
III. The tissues that make up the veins are thicker than the arteries.
IV. Blood flow is faster in the arteries than in the veins.

- A. I, III, and IV only
B. I, II, and IV only
C. II and IV only
D. All of the above

5. The photo below shows water (left) and mercury (right) in a test tube. Which of the following inferences we can draw based solely from the photo?



Figure 3. Water (left) and mercury (right) in test tubes

- A. Mercury is denser than water.
B. The mercury-wall attraction is greater than the water-wall attraction.
C. Mercury-mercury attraction is greater than the mercury-wall attraction.
D. Water-water has the weakest attraction.





8. Which of the following statements about the periodic trends is/are FALSE?

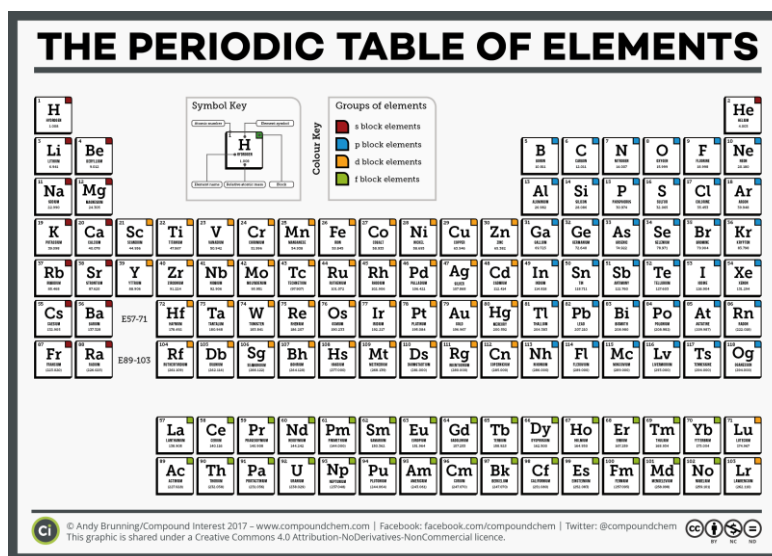


Figure 5. Periodic Table of Elements (Source: ChemEurope.com)

- I. It is easier to take a valence electron out from an atom as you go down a group.
- II. The value of the ionization energy becomes more positive as you go up a group.
- III. The atomic size increases as you move from left to right at the same period.
- IV. Atoms at the top rightmost part of the periodic table have the highest tendency to keep electrons in a bond.

- A. II only
- B. II and III only
- C. III only
- D. II and IV only

9. The following statements provide information about the classification hierarchy of domesticated cats (*Felis catus*):

- i. Cats and cougar are both classified under *felis*.
- ii. Cats and lions are both classified under *felidae*.
- iii. Cats and foxes are both classified under *carnivora*.

Which of the following statements is FALSE?

- A. Cats are least alike to foxes.
- B. There is no organism classified under *felis* that is not classified under *carnivora*.
- C. There is an organism classified under *carnivora* but not under *felis*
- D. Cougars are more alike to foxes than lions.





13. The diagram below shows the structures of ethanol, diethyl ether, and pentane. Which of the following inferences is **FALSE**?

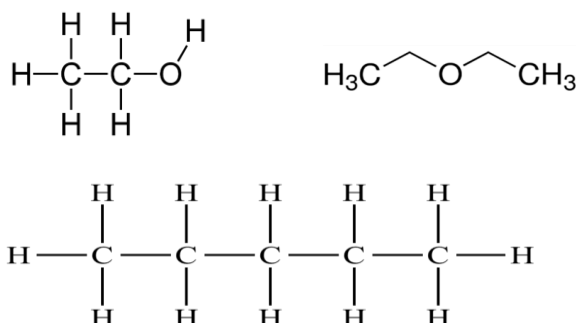


Figure 6. Chemical structures of ethanol (top left), diethyl ether (top right) and pentane (bottom)

- A. Ethanol has the highest boiling point.
B. Both diethyl ether and pentane are non-polar solvents.
C. Ethanol is the least chemically reactive.
D. Only ethanol is soluble to water.
14. Water is a fundamental compound for almost all living organisms. Which of the following statements about the properties of water is/are **TRUE**?
- I. The boiling point of pure water is always 100 °C.
II. Water molecules have linear shape which allows for its surface tension.
- A. Statement I only
B. Statement II only
C. Both statements I and II
D. Neither statement I nor II
15. An object with mass m is dropped in two newly discovered planets X and Y whose gravities are twice and one fourth of Earth's acceleration due to gravity respectively. If the drop was done at the same height and without any initial velocity, which of the statements below is/are **FALSE**?
- I. The impact of fall is hardest in planet X and lightest in planet Y.
II. The impact velocity in planet X is twice of that in Earth.
III. The impact velocity in planet Y is one half of that in Earth.
- A. II only
B. III only
C. II and III only
D. All statements are true





16. At what point in its orbit would the Moon be during a new moon?

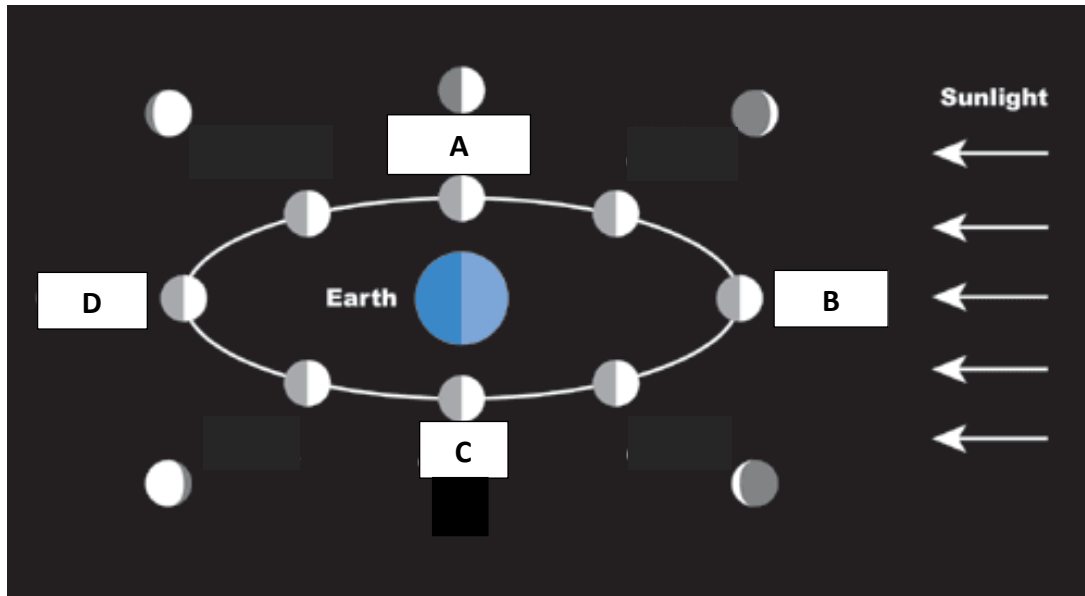


Figure 7. Phases of the Moon

17. Which of the following statements about the Hertzsprung-Russell diagram below is/are TRUE?

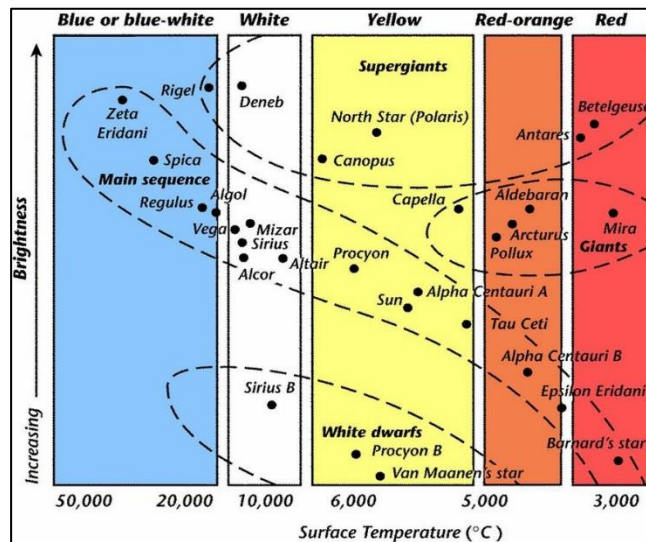


Figure 8. Hertzsprung-Russell diagram

- I. White dwarfs are the dimmest stars.
- II. Color is not an indicator of brightness.
- III. Giants are the hottest stars among the other groups.
- IV. Supergiants are the most luminous among the other groups.

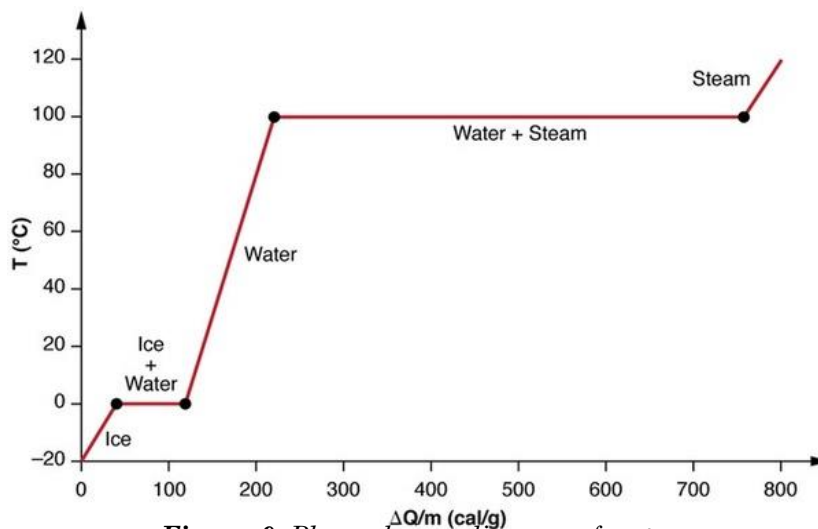
- A. I and IV only
- B. I, II, and IV only

- C. II and IV only
- D. All of the above

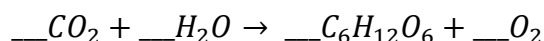




18. The diagram below shows the phase change diagram of water. Which of the following observations is inconsistent with the diagram?



- A. The flat regions demonstrate the phase change of water
B. It is more difficult to vaporize water than to melt ice
C. The temperature of a substance changes during phase change
D. None of the above
19. Which of the following statements about two-dimensional projectile motion is **FALSE**?
- A. The horizontal displacement of a projectile is independent of gravity.
B. At the maximum height, the overall velocity is zero.
C. The projectile moves horizontally at a uniform speed.
D. All statements are true.
20. Photosynthesis is the vital process that allows plants to make use of carbon dioxide and water in producing their food. The basic photosynthesis reaction is shown below:



If 20 g of carbon dioxide and 50 g of water are present, how much glucose in grams is produced?

Use the following molar masses (g/mol): CO_2 : 44, H_2O : 18, $C_6H_{12}O_6$: 180, O_2 : 32

- A. 13.6 g
B. 81.8 g
C. 83.3 g
D. 600 g





PART III - Earth Science

21. The diagram below shows a displacement versus time graph of a particular object. Which of the following statements regarding the four regions of the curve is **FALSE**?

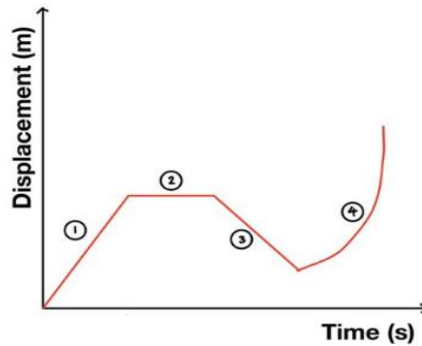


Figure 10. Phase change diagram of water

- A. The object moved with constant acceleration to a particular direction in the first region.
B. The object stopped in the second region.
C. The object went to the opposite direction in the third region.
D. Lastly, the object turned back to its original direction and accelerated.
22. Which of the following species will **NOT** die out if the mangoes are removed from the ecosystem?

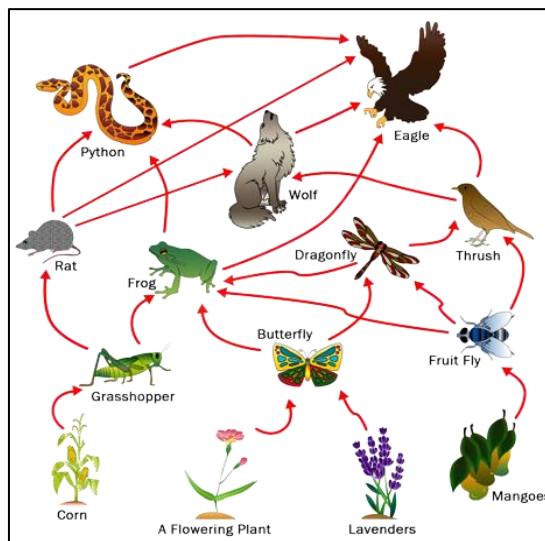


Figure 11. Food web

- A. Fruit fly
B. Butterfly
C. Dragonfly
D. Thrush





23. Which of the following comparisons between pairs of electromagnetic waves is **WRONG**?

- A. Wavelength: Orange > Blue
- B. Frequency: X-ray > Ultraviolet
- C. Speed in vacuum: Gamma > Radio
- D. Energy: Ultraviolet > Infrared

24. Which of the following is **NOT** a chemical change?

- A. Forming glass from sand
- B. Breaking glass
- C. Digesting food
- D. Lighting a matchstick

25. Which of the following illustrates a precise yet inaccurate experiment?

- A. A student misread the analytical balance and recorded the weight to be 100 grams instead of 10 grams.
- B. The voltmeter was not calibrated therefore adding 5 V to each measurement.
- C. A student was able to synthesize a compound with 98% purity in all his trials.
- D. Both A and B

26. Which of the following statements about the offspring of a homozygous tall pea and a homozygous short pea is **FALSE** assuming that the tall trait is dominant?

- I. It is not certain that the offspring is tall
- II. There is a way to obtain a short trait by crossing an offspring with a homozygous tall pea
- III. A pea with the short trait can be obtained by crossing the two offsprings
- IV. All of the offsprings have heterozygous dominant alleles

- A. II and III only
- B. I, II, and IV only
- C. I and IV only
- D. I and II only





27. Which of the following statements is **FALSE** about the isotope Manganese-61 (${}_{25}^{61}\text{Mn}$)?

- I. The number of electrons and protons are the same
- II. There are 61 neutrons in the isotope Mn-61
- III. A different manganese isotope won't have $Z = 25$
- IV. There are 25 electrons in Mn-61

- A. I and II only
- B. II and IV only

- C. II and III only
- D. I, II, and III only

28. The statements below attempt to describe the logistic growth model whose diagram is shown below. Which of the statements is/are **TRUE**?

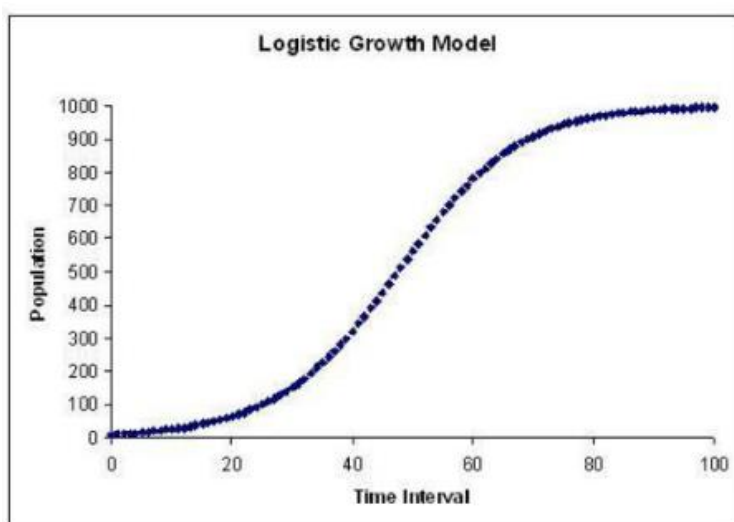


Figure 12. Logistic growth model

Statement 1: The logistic growth model includes a fast exponential growth before settling down to a particular value.

Statement 2: The value at which the curve settles down is the maximum capacity at which the environment can sustain the species.

- A. Statement 1 only
- B. Statement 2 only

- C. Both statements 1 and 2
- D. Neither statement 1 nor 2





29. By how much would the strength of attraction between stationary opposite electric charges increase if the individual charges were quadrupled and the distance between the charges were doubled?
- A. Stay the same
B. Doubled
C. Quadrupled
D. Eightfold increase
30. Which of the following is **NOT** evidence in support of the continental drift theory?
- A. Fit of the continents
B. Fossils of the same species appearing in two different continents
C. Seemingly connected mountain ranges that are in two different continents
D. None of the above



You have reached the end of this challenge. Congratulations!