

2017-2018

P.H.S. – Exam 2

Name: Mr. Lin

Date:

Mark:

Instruction: (1) Total 5 pages with 5 parts

(2) Calculators are allowed

Part A: Multiple Choice Questions – Circle the correct answers (Total 20 marks@2 marks each)

1. What is a light year?
 - a. How fast light will travel in one year
 - b. Time for Mr. Lin to complete *lightlin.com* website
 - c. Opposite of shadow year where people living in fear
 - d. How far light will travel in one year
2. Which planet is the largest planet?
 - a. Mercury
 - b. Saturn
 - c. Jupiter
 - d. Pluto
3. It is the brightness of stars in the night sky as they appear from Earth
 - a. Luminosity
 - b. Apparent Magnitude
 - c. Solar Mass
 - d. Absolute Magnitude
4. What type of reaction produces the energy in the sun?
 - a. Nuclear Fission
 - b. Nuclear Fusion
 - c. Friction
 - d. Thermal Convection
5. Where are stars born?
 - a. Nebula
 - b. Black Hole
 - c. Supernova
 - d. Neutron Star
6. The control center or brain of the cell is the
 - a. Nucleus
 - b. Mitochondria
 - c. Cell membrane
 - d. Endoplasmic reticulum

7. Lysosome is involved in
 - a. Protein synthesis
 - b. Produce energy for cell to use
 - c. Aid in the digestion of nutrient molecules
 - d. Regulate movement of material
8. How many different types of nitrogen bases are found in nucleotides?
 - a. 2
 - b. 4
 - c. 8
 - d. 10
9. The centromeres move toward the poles in which phase?
 - a. Prophase
 - b. Metaphase
 - c. Anaphase
 - d. Telophase
10. How many daughter cells will be produced at the end of the meiosis?
 - a. 1
 - b. 2
 - c. 3
 - d. 4

Part B: Matching (Total 20 marks@2 marks each)

Match the following words with their definitions. Write the letter on the left-hand side

- | | | | | |
|-----|----------|-------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------|
| 1. | h | Heliocentric planetary system | a. | Consists of cytosol, which is made up of water, salts and organic molecules, etc |
| 2. | b | Astronomical unit | b. | Average distance between the earth and the sun |
| 3. | e | Asteroids | c. | A large planet composed mostly of gases, such as hydrogen and helium |
| 4. | c | Gas Giants | d. | 9.4607E15m |
| 5. | g | Organelles | e. | Rocky objects in between Mars and Jupiter |
| 6. | a | Cytoplasm | f. | A planet that is composed primarily of silicate rocks or metals |
| 7. | i | Chromosomes | g. | Discrete structures in the cell that has a specialized function |
| 8. | n | Genes | h. | A system where earth and planets revolve around the sun |
| 9. | j | Tetrad | i. | a threadlike structure of nucleic acids and protein found in the nucleus, carrying genetic information in the form of genes |
| 10. | k | Crossing over | j. | A group of four |
| | | | k. | A process when a part of a chromatid is physically exchanged with another part of a chromatid |
| | | | l. | A group of ten |
| | | | m. | Rock or metal that is trapped by Earth's gravity and pulled down through Earth's atmosphere |
| | | | n. | Basic physical and functional unit of heredity, made up of DNA |
| | | | o. | A system where earth is the center of the universe and other objects orbit around it |
| | | | p. | A process where sister chromatids separate at centromeres |

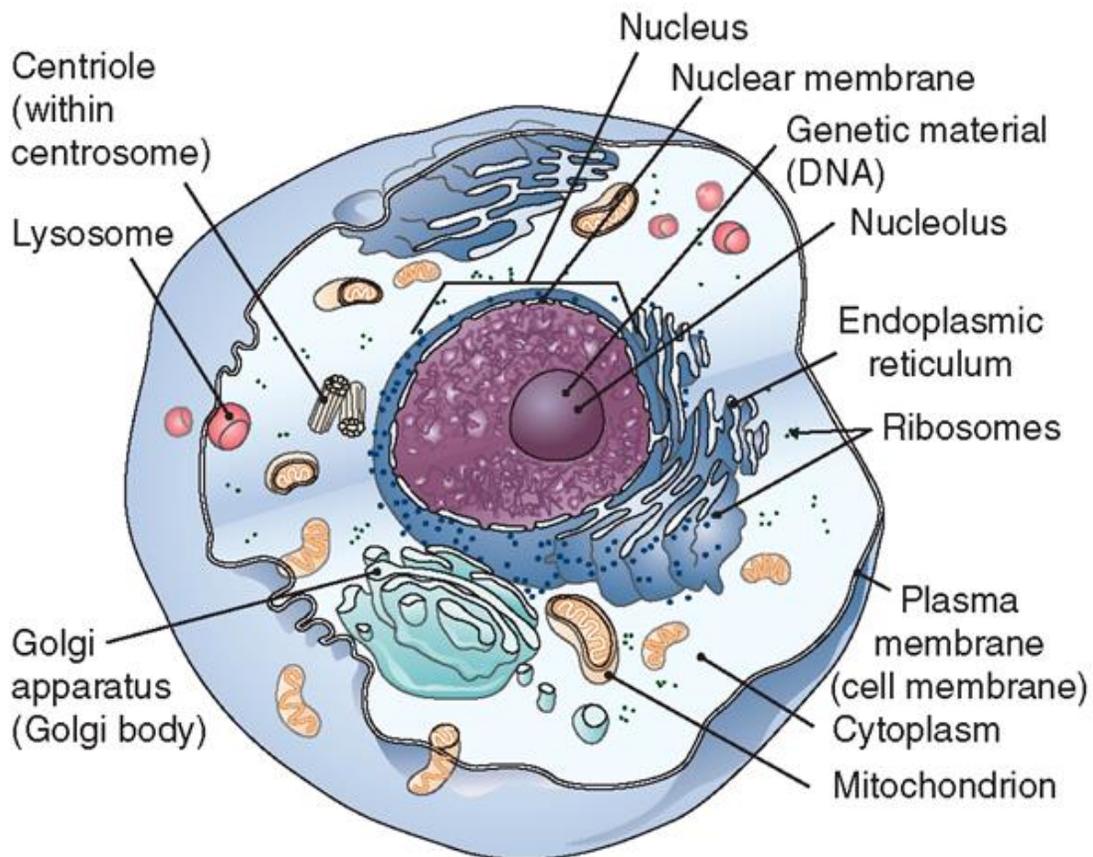
Part C: Short Answer (Total 20 marks@10 marks each)

1. Label the following 10 celestial objects.



Sun, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto

2. Label the following 10 organelles.



Hint: Mitochondrion, Nucleus, Nuclear membrane, Centriole, Lysosome, Endoplasmic reticulum, Plasma membrane, Cytoplasm, Golgi apparatus, Ribosomes

Part D: Calculations (Total 20 marks)

1. (6 marks) As you know, our Sun has a limited lifespan. Over the next 5 000 000 000 years, it will burn the last of its hydrogen, bloat up as a red giant and consume Mercury and Venus. The circumference of the Earth is 40075km. How many times can we circle around the earth before the end of world by walk. (Hint: average human walking speed is about 5.0 km per hour)

$$5\,000\,000\,000 / (40075 / 5 / 24 / 365) = 5\,464\,753\,587 \text{ times}$$

2. (6 marks) Achernar is the brightest 'star' or point of light in, and lying at the southern tip of, the constellation of Eridanus, and the tenth-brightest in the night sky. It is approximately 1 315 000 000 000 000 km from the Sun. Achernar exploded at the exact moment when Jack is born. Would Jack be able to observe the explosion of the star during his life time on earth? (Hint: the speed of light is approximately 300 000 000 m/s)

$$1\,315\,000\,000\,000\,000 / 300\,000\,000 / 60 / 60 / 24 / 365 = 139 \text{ years}$$

Jack would not be able to observe the explosion since it takes 139 years for light to travel to earth, and Jack is long dead by then

3. (8 marks) The bacteria we know most about is E. coli. This has been studied for a long time. The conditions that allow a bacterium to grow best are called the "optimum conditions". When E. coli is growing in optimum conditions (nice and warm, lots of nutrients), each individual cell can divide into two cells every 20 minutes. With one E. coli at 10:00am, how many E. coli would we have at 4:00pm the same day?

$$2^{(3 \times 4 + (12 - 10))} = 262144$$

Part E: Long Answer (Total 20 marks@5 marks each)

1. How does the tilt of the earth affect the seasons?

The seasons are caused as the Earth, tilted on its axis, travels in a loop around the Sun each year. Summer happens in the hemisphere tilted towards the Sun, and winter happens in the hemisphere tilted away from the Sun. As the Earth travels around the Sun, the hemisphere that is tilted towards or away from the Sun changes.

2. Briefly describe the history of astronomy. (please include names such as: Aristarchus, Ptolemy, Nicholas Copernicus, Johannes Kepler, Galileo Galilei)

In 3rd century B.C. Aristarchus suggested a heliocentric planetary system, but on the other hand, Ptolemy suggested the geocentric model of the universe. Nicholas Copernicus advanced the idea that the Sun is in the center of the Solar System. Johannes Kepler formulated the Three Laws of Planetary Motion which described the way planets moved through the Solar System for the first time. Galileo Galilei was the first person to use the telescope to look at these celestial bodies.

3. What is the difference between mitosis and meiosis? (list 3 differences for full marks)

I. Mitosis consists of one stage whereas meiosis consists of two stages.

II. Mitosis produces diploid cells (46 chromosomes) whereas meiosis produces haploid cells (23 chromosomes).

III. Mitosis produces two identical daughter cells whereas meiosis produces four genetically different daughter cells.

4. How do we get DNA out of spinach?

Blend the water, salt, and spinach together, then add dish washing soap, then add a pinch of meat tenderizer, then add rubbing alcohol

Bonus Question (Total 3 marks)

What is the complementary strand of the following DNA strand?



TAGGCCTAAGTAGC