

INTERNATIONAL **STEM** OLYMPIAD
GRAND FINAL

GRADES 6-7-8

**SCIENCE
PAST PAPERS**

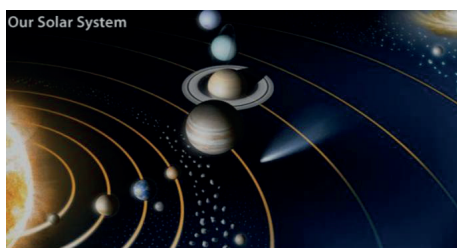
1.

When an electric current passes through a gas, it gives energy to the gas, which is then released as light of specific colours. This is called a line emission spectrum.

Why are line emission spectra of elements referred to as "atomic fingerprints"?

- A) They are all the same
- B) They are all unique
- C) They are all similar
- D) They all contain different colours of light

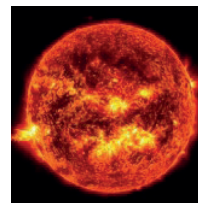
2.



Which statement is correct about the motion of planets in the solar system?

- A) All planets have the same speed.
- B) Planets farther from the Sun move more slowly than those closer to it.
- C) Planets closer to the Sun move more slowly than those farther from it.
- D) None of them.

3.



The sun is a hot ball of gas. It gives off heat and light energy that the Earth absorbs. This heat from the sun is essential for life on Earth.

What kind of reactions happening inside the sun create solar energy?

- A) nuclear fission
- B) nuclear fusion
- C) gravitational contraction
- D) gradually expanding in size

4.

Which of the following provides evidence for the Big Bang Theory?

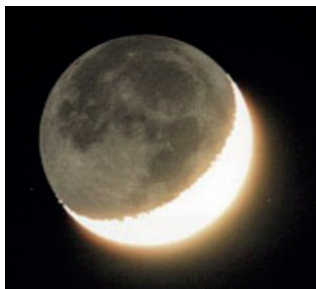
- A) Cavemen heard a loud bang at the beginning of time.
- B) The universe isn't moving.
- C) The universe is expanding.
- D) The universe is getting smaller.

5.

Which statement provides the best description of the age of our solar system and the universe?

- A) Our solar system and the universe are estimated to be 5 billion years old.
- B) Our solar system and the universe are estimated to be 10 billion years old.
- C) Our solar system is at least twice as old as the universe.
- D) The universe is roughly 14 billion years old.

6.



Why do we always see the same face of the Moon when we look at it from Earth?

- A) The Earth rotates slower than the Moon.
- B) The Moon completes its orbit around the Earth and around itself at the same time.
- C) The Moon is always in the same place.
- D) The Moon rotates slower than the Earth.

7.

Which of the following statements about light years is correct?

- A) It is the distance the Earth travels in a year.
- B) It is a one-year period in space.
- C) It is the time for the Earth to go around the sun.
- D) It is the distance light travels through space in a year.

8.

Which of the following provides the best evidence that the universe is expanding?

- A) Spiral shape of the Milky Way galaxy.
- B) Red shift in the light from distant galaxies.
- C) Change in the swing direction of a Foucault pendulum.
- D) Parallelism of Earth's axis in orbit.

9. In certain Robotics applications, it's important for a robot to avoid colliding with obstacles.

Which of the following sensors should we use for this purpose?

- A) Light sensor
- B) Sound sensor
- C) Ultrasonic sensor
- D) Touch sensor

10. Which of the following statements about sound waves is true?

- I. Sound is a mechanical wave.
- II. The speed of sound waves is greater in solids than in liquids.
- III. The speed of sound wave propagation does not depend on the temperature of the environment.

- A) I, II and III
- B) II and III
- C) Only I
- D) I and II

11. Albert, who has difficulty hearing, is watching a movie. Since he can't hear the sounds very well, Albert asks his son to increase the movie volume even more.

What aspect of sound did Albert's son change?

- A) Intensity
- B) Frequency
- C) Tone
- D) Speed

12.



To assess the health of babies in the womb, doctors use a device called ultrasound. The ultrasound device emits sound waves that are inaudible to the human ear.

Which of the following statements about how ultrasound works is correct?

- I. It operates based on the principle that sound waves echo through the tissues in the body.
- II. It relies on the fact that the speed of sound wave propagation is consistent across different tissues in the body.
- III. It takes advantage of the varying speed of sound wave propagation in different tissues in the body.

- A) I and II
- B) II and III
- C) Only I
- D) I and III

13.

David makes a sound by tapping a bottle with some water in it slowly using a stick. Then, he adds more water to the bottle and taps it faster with the stick to produce a sound. What can you say about the intensity and frequency of the sound waves created?

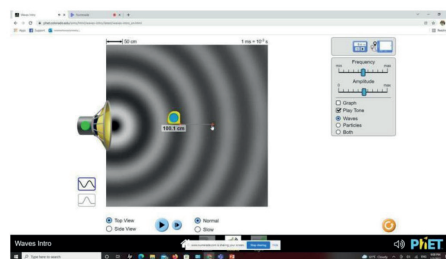
- A) They both increase.
- B) The intensity increases, but the frequency remains the same.
- C) The intensity remains the same, but the frequency increases.
- D) The intensity increases, but the frequency decreases.

14.

What sensor does a robot need to determine if the environment is too dark?

- A) Light sensor
- B) Sound sensor
- C) Ultrasonic sensor
- D) Touch sensor

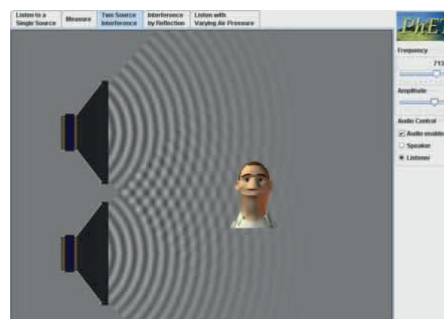
15.



How does an observer's movement affect the sound from a stationary source when they run away with a speed of V ?

- A) The observer will hear a low-frequency sound when moving away from a stationary sound source.
- B) The observer will hear a high-frequency sound when moving away from a stationary sound source.
- C) The observer will hear sound with longer wavelengths when moving towards a stationary sound source.
- D) None of the above.

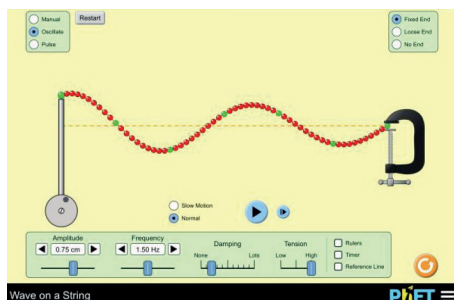
16.



In the figure, sound waves are coming from two sources and traveling through the same medium. Which of the following statements about sound waves traveling in the same medium is incorrect?

- A) The wavelength of the sounds produced by the two sources can be different.
- B) The speed of the sounds from the two sources can be different.
- C) The frequencies of the sounds produced by the two sources can be different.
- D) The speed of the sounds from the two sources can be the same.

17.



In the system shown in the figure, a string is connected to the end of a metal rod. This creates a wave that is caused by the up-and-down movement of the metal bar.

If the metal rod moves up and down faster, which of the following do we observe?

- A) The wavelength of the wave increases.
- B) The wavelength of the wave remains constant.
- C) The frequency of the wave increases.
- D) The frequency of the wave decreases.

18.

The electromagnetic spectrum is a range of electromagnetic waves with varying wavelengths and frequencies. Consider the following statements:

Statement A: Visible light is a part of the electromagnetic spectrum that humans can perceive with their eyes.

Statement B: X-rays have longer wavelengths than radio waves.

Which of the following options is correct?

- A) Both Statement A and Statement B are true.
- B) Statement A is true, but Statement B is false.
- C) Statement A is false, but Statement B is true.
- D) Both Statement A and Statement B are false.

19.



The Kelvin scale is a unit of temperature used primarily in the scientific world. The scale was invented by Lord Kelvin who saw the need for a scale where absolute zero was the null point, meaning 0 K is the lowest possible temperature.

What is the absolute zero in Celsius?

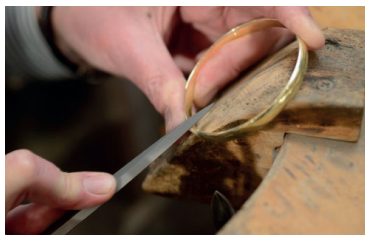
- A) 0
- B) 100
- C) 273
- D) -273

20.

Which one of the following cannot travel through a vacuum?

- A) Light
- B) Magnetic lines
- C) Sound
- D) Heat

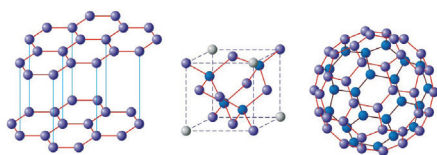
21.



What is the most malleable metal which we can roll into sheets thin enough to transmit light?

- A) Copper B) Silver C) Gold D) Mercury

22.

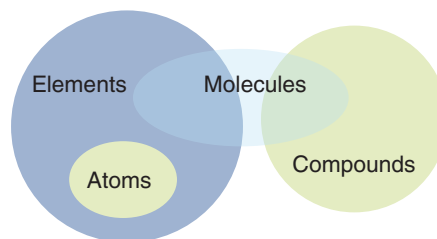


When considering the three allotropes of pure carbon, which are diamond, graphite, and fullerenes, which of the following statements can be made?

- I. They have similar chemical properties.
- II. They have different physical properties.
- III. They contain different types of atoms.

- A) I B) II C) III D) I-II

23.



What is the correct ascending order of the mass for nitrogen?

- I. An atom of nitrogen
- II. One gram of nitrogen
- III. A molecule of nitrogen

- A) I < II = III B) I < III < II
C) II = III < I D) III < II < I

24.



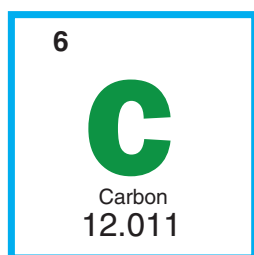
In the realm of highly ordered matter, crystals exhibit a precise and well-structured arrangement of molecules throughout their entire body. Each molecule in a crystal is surrounded by other molecules in a symmetrical and defined manner.

Which of the following options are examples of crystalline solids?

- I. Table salt
- II. Quartz
- III. Diamond
- IV. Sugar

- A) I and IV
B) II and III
C) I, II and III
D) I, II, III and IV

25.



Considering the carbon atom, its components, and their interactions, which of the following Identify the correct subatomic particles associated with carbon.

I. Molecules

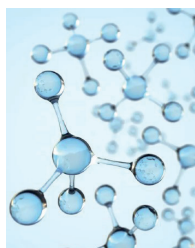
II. Electrons

III. Neutrons

IV. Protons

- A) Only I B) II and III
C) I, II and III D) II, III and IV

26.



Considering the properties of compounds, which of the following statements correctly describe them.

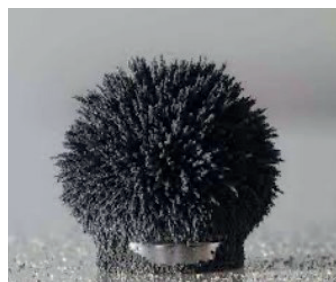
I. Compounds are composed of at least two different types of atoms.

II. There exists a fixed ratio between the elements that form a compound.

III. Compounds cannot be separated into their constituent elements through physical means.

- A) I B) II C) I-II D) I-II and III

27.



Which one of the following pairs contain only magnetic elements?

- A) Fe, Cr B) Ni, Cr
C) Fe, Pb D) Co, Ni

28.



Considering the properties of water for 10 g and 100 g samples, which of the following statement(s) are correct regarding these samples.

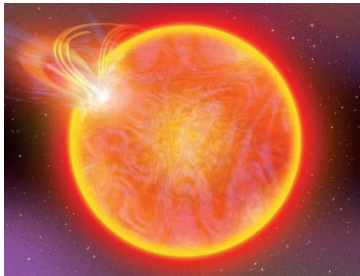
I. The boiling points are the same.

II. The densities are different.

III. The volumes are the same.

- A) I B) III C) I-II D) I-III

29.

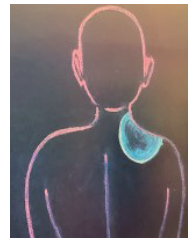


The Sun manages to keep shining over time by generating energy through a subtle chain of fusion reactions. These reactions involve the combination of 4 protons to form a nucleus of a specific element, which releases energy.

Which of the following is the correct element that explains the fusion reactions at the core of the Sun?

- A) Hydrogen
- B) Helium
- C) Carbon
- D) Oxygen

30.

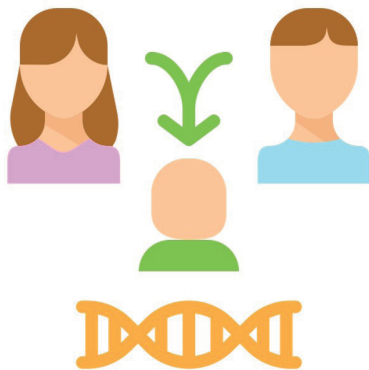


"This is a description of a disease characterized by the interference of malignant cells with the normal functioning of healthy cells. These malignant cells can form a mass and metastasize to other areas of the body."

What disease is being described in this article?

- A) AIDS
- B) Smallpox
- C) Cancer
- D) Corona

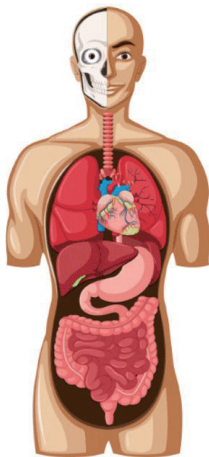
31.



Which of the following is responsible for passing traits from parents to offspring?

- A) Genes
- B) Hormones
- C) Enzymes
- D) Blood

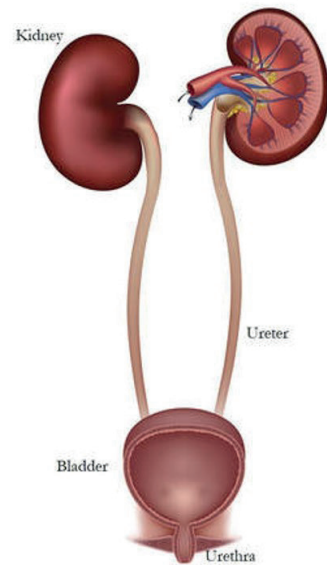
32.



Which of the following is the smallest unit of life?

- A) Cell
- B) Tissue
- C) Organ
- D) Organ system

33.



What is the primary function of the urinary system in the human body?

- A) Producing hormones
- B) Filtering blood and removing waste products
- C) Breaking down food into nutrients
- D) Transporting oxygen to body cells

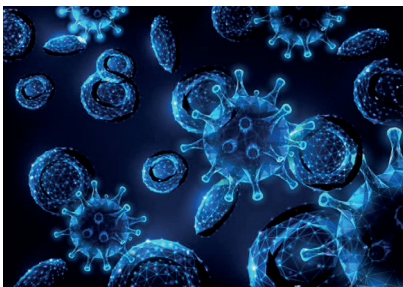
34.



Which of the following describes sexual reproduction?

- A) Involves the fusion of an egg and a sperm
- B) Involves the division of a single parent cell into two identical offspring
- C) Involves the production of offspring without the involvement of gametes
- D) Involves the production of offspring that are genetically identical to the parent

35.



Which of the following is the body's first line of defense against pathogens?

- A) Immune system
- B) Respiratory system
- C) Nervous system
- D) Skin

36.



Which of the following statements is true about electric cars?

- A) They run on gasoline
- B) They emit more CO₂ than gasoline-powered cars
- C) They require longer charging time than refueling time for gasoline-powered cars
- D) They are less energy-efficient than gasoline-powered cars

37.



Which of the following best describes an autonomous car?

- A) A car that is driven by a robot
- B) A car that can drive itself without human control
- C) A car that can only be driven by adults
- D) A car that is powered by electricity

38.



What is artificial intelligence?

- A) The study of the natural world and its phenomena
- B) The science of creating machines that can perform tasks that typically require human intelligence
- C) The study of the structure, behavior, and interactions of natural systems
- D) The branch of science that deals with the properties, composition, and structure of matter

39.



Which of the following is an environmental issue caused by human activities?

- A) Volcanic eruptions
- B) Solar flares
- C) Deforestation
- D) Earthquakes

40.



What is climate change?

- A) A natural process that occurs in cycles
- B) A gradual increase in the Earth's temperature due to human activities
- C) A sudden change in the Earth's climate caused by natural disasters
- D) A change in the weather patterns that occurs only in the polar regions.

