**Astronomy Assessment and TPS Questions:**

**Light and Atoms**

1. Energy is released from atoms in the form of light when electrons
   1. move from high energy levels to low energy levels.
   2. move in their orbit around the nucleus.
   3. move from low energy levels to high energy levels.
   4. are emitted by the atom.
   5. are absorbed by atoms.
2. If an electron in an atom moves from an energy level of 5 to an energy level of 10,
3. a photon of energy 5 is emitted.
4. a photon of energy 15 is emitted.
5. a photon of energy 5 is absorbed.
6. a photon of energy 15 is absorbed.
7. If an electron in an atom moves from an energy level of 10 to an energy level of 5,
   1. a photon of energy 5 is emitted.
   2. a photon of energy 15 is emitted.
   3. a photon of energy 5 is absorbed.
   4. a photon of energy 15 is absorbed.
8. If an electron in an atom moves from an energy level of 3 to an energy level of 6,
   1. a photon of energy 3 is absorbed.
   2. a photon of energy 9 is emitted.
   3. a photon of energy 3 is emitted.
   4. a photon of energy 9 is absorbed.
9. How does the Sun produce the energy that heats our planet?
   1. The gases inside our Sun are burning and producing energy.
   2. Light atoms are combined into heavier atoms, giving off energy.
   3. Gas inside the Sun heats up when compressed, giving off energy.
   4. Atoms are broken apart into lighter atoms, giving off energy.
   5. The core of the Sun has radioactive atoms that decay, giving off energy.
10. In which part of the Sun does nuclear fusion take place?
11. photosphere
12. corona
13. core
14. radiative layer
15. nucleosphere

*Use the drawings below to answer the next two questions.*

**A. B. C. D.**

e-

e-

e-

e-

1. Which drawing (not to scale) represents the process by which an absorption line is formed?
2. Which drawing (not to scale) represents the process by which an emission line is formed?

*Use the drawings below to answer the next two questions.*

e-

B

e-

C

e-

D

e-

A

1. Which atom would be absorbing light with the greatest energy?
2. Which atom would emit light with the shortest wavelength?

Use the diagram below to answer the following three questions. Below is the energy level diagram of a particular atom. The amount of energy it takes to move an electron from the lowest energy level (or ground level) up to each of the higher energy levels (or excited energy levels) is shown next to each energy level.

10

8

5

0

1. How many photons of different energy can be emitted from this atom?
   1. 3
   2. 5
   3. 6
   4. 12
   5. None of the above is correct.
2. With the electron in the energy level labeled with the number “8”, how many photons of different energy can be emitted by this atom?
   1. None
   2. Only one
   3. Two
   4. Three
   5. More than three
3. Which of the following would result in a photon being emitted from the atom with the longest possible wavelength.
4. If an electron dropped from level 10 to level 0.
5. If an electron jumped from level 0 to level 10
6. If an electron dropped from level 10 to level 8
7. If an electron jumped from level 8 to level 10
8. None of the above is correct.

Use the diagram below to answer the following three questions. Below is the energy level diagram of a particular atom. The amount of energy it takes to move an electron from the lowest energy level (or ground level) up to each of the higher energy levels (or excited energy levels) is shown next to each energy level.

9

8

5

0

1. How many photons of different energy can be emitted from this atom?
2. 3
3. 5
4. 6
5. 12
6. None of the above is correct.
7. With the electron in the energy level labeled with the number “8”, how many photons of different energy can be emitted by this atom?
8. None
9. Only one
10. Two
11. Three
12. More than three
13. Which of the following would result in a photon being emitted from the atom with the longest possible wavelength.
    1. If an electron dropped from level 9 to level 0.
    2. If an electron jumped from level 0 to level 9
    3. If an electron dropped from level 9 to level 8
    4. If an electron jumped from level 8 to level 9
    5. None of the above is correct
14. Each of the drawings (A-D) shows a molecule at two different times: once before and once after a photon of light has either been emitted or absorbed. Which drawing corresponds to the absorption of a photon with the shortest wavelength?

Before

A

After

Before

B

After

After

Before

C

After

Before

D

Use the diagram below to answer the following two questions. Below is the energy level diagram of a particular atom. The amount of energy it takes to move an electron from the lowest energy level (or ground level) up to each of the higher energy levels (or excited energy levels) is shown next to each energy level.

12

9

5

0

- A photon with an energy of 3

- A Photon with an energy of 4

- A Photon with an energy of 5

- A Photon with an energy of 9

- A Photon with an energy of 10

1. Consider the list of photons provided at right. How many of these photons could be emitted from this atom?
   1. Only one
   2. Two
   3. Three
   4. Four
   5. All five
2. Which of the following would result in a photon being emitted from the atom with the longest wavelength.
   1. If an electron dropped from level 12 to level 5.
   2. If an electron jumped from level 5 to level 9.
   3. If an electron jumped from level 9 to level 12.
   4. If an electron jumped from level 5 to level 12
3. Which of the following would give off the most energy?
   1. a red star half the size (diameter) of the Sun
   2. a red star 10 times the size (diameter) of the Sun
   3. a blue star half the size (diameter) of the Sun
   4. a blue star 10 times the size (diameter) of the Sun
4. All photons travel with the same \_\_\_\_\_\_\_\_.
   1. Speed
   2. Wavelength
   3. Frequency
   4. Direction
5. The gap between energy levels \_\_\_\_\_\_\_\_ as you go up in energy levels.
   1. will get smaller
   2. will get bigger
   3. will not change
6. When a(n) \_\_\_\_\_\_\_ moves to a lower energy level, the energy it loses is emitted as a(n) \_\_\_\_\_\_\_.
   1. Atom, electron
   2. Electron, atom
   3. Photon, electron
   4. Electron, photon
7. When a(n) \_\_\_\_\_\_\_ is absorbed, the energy causes a(n) \_\_\_\_\_\_\_\_ to move to a higher energy level.
   1. photon, electron
   2. electron, photon
   3. atom, electron
   4. electron, atom
8. An emission line is formed when:
   1. an electron goes from a high energy level to a low energy level.
   2. an electron goes from a low energy level to a high energy level.
   3. an electron is emitted from the atom.
   4. an electron moves in its orbit around the nucleus of the atom.
9. When an atom absorbs light, which of the following occurs?
   1. An electron goes from a high energy level to a low energy level.
   2. An electron goes from a low energy level to a high energy level.
   3. A photon goes from a high energy level to a low energy level.
   4. A photon goes from a low energy level to a high energy level.
10. When light is absorbed by an atom, electrons \_\_\_\_\_\_\_\_\_.
    1. From the light are also absorbed by the atom
    2. Are always emitted from the atom
    3. Move from low energy levels to high energy levels
    4. Move from high energy levels to low energy levels
    5. Move in orbit around the nucleus of the photon
11. What is ionization?
    1. The process of a photon being ejected from an atom
    2. The process of an electron being ejected from an atom
    3. The process of a photon jumping to a higher energy level
    4. The process of an electron jumping to a higher energy level
12. An electron that makes a bigger jump will emit a photon that is \_\_\_\_\_\_\_\_.
    1. Travelling faster
    2. Travelling slower
    3. More blue
    4. More red
13. If all of the electrons in an atom are at ground state, which of the following is impossible?
    1. It is impossible for the atom to absorb a photon of light with a long wavelength.
    2. It is impossible for the atom to emit a photon of light with a short wavelength.
    3. It is impossible for ionization to occur.
    4. It is impossible for the atom to absorb blue light.

Below is the energy level diagram of a particular atom. The amount of energy it takes to move an electron from the lowest energy level (or ground level) up to each of the higher energy levels (or excited energy levels) is shown next to each energy level.

10

8

5

0

0

1. Using the diagram above, between which two energy levels would it take the most energy to move the electron?
2. Level 0 to 5
3. Level 5 to 8
4. Level 8 to 10

Below is the energy level diagram of a particular atom. The amount of energy it takes to move an electron from the lowest energy level (or ground level) up to each of the higher energy levels (or excited energy levels) is shown next to each energy level.

16---------------------------------------------------------------

14---------------------------------------------------------------

11---------------------------------------------------------------

7---------------------------------------------------------------

0--------------------------------------------------------------

1. Using the diagram above, which of the following would be true if the atom emitted a photon with the highest possible frequency?
2. An electron jumped from level 14 to level 16
3. An electron dropped from level 16 to level 0
4. An electron jumped from level 0 to level 16
5. An electron dropped from level 16 to level 14
6. None of the above is correct.
7. Using the diagram above, if the atom released a photon of gamma ray light, the electron most likely began the process at which energy level?
8. Level 0
9. Level 7
10. Level 11
11. Level 16
12. Using the diagram above, in order to ionize an electron that is currently at level 11, what would the atom have to do?
13. Absorb a photon of energy equal to or greater than 6
14. Emit a photon of energy equal to or greater than 12
15. Absorb a photon of energy equal to or greater than 5
16. Emit a photon of energy equal to or greater than 6
17. Emit a photon of energy equal to or greater than 5
18. Using the diagram above, how many photons of different energy can this atom absorb?
    1. 4
    2. 9
    3. 10
    4. 16

e-

B

e-

C

e-

D

e-

A

1. Using the diagram above, which of the pictures shows the atom that is emitting the light with the shortest wavelength?
   1. A
   2. B
   3. C
   4. D
2. Using the diagram above, which of the pictures shows the atom that is absorbing the light with the lowest frequency?
   1. A
   2. B
   3. C
   4. D