

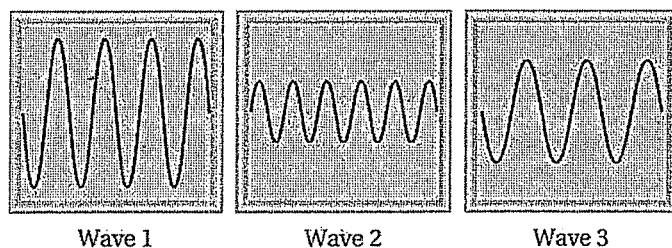
Practice Questions

Multiple—Choice:

1. Einstein reasoned that when light struck the surface of a metal, electrons would leave the metal with a particular energy (photoelectric effect). Which of the following would *increase* the energy of these ejected electrons?
 - (A) Changing the color of the light from red to blue
 - (B) Changing the color of the light from violet to yellow
 - (C) Increasing the intensity of the light
 - (D) Using radio waves rather than visible light
2. Heisenberg's uncertainty principle stipulated that the _____ and _____ could not be precisely determined for an electron at the same time. Which of the following pairs of quantities would make the above statement true?
 - (A) mass and location
 - (B) mass and momentum
 - (C) momentum and charge
 - (D) momentum and location
3. What is the maximum number of electrons that can occupy the 4th energy level of an atom?
 - (A) 10
 - (B) 14
 - (C) 18
 - (D) 32

4. In an attempt to determine the concentration of a dark red colored solution containing FeSCN^{2+} , produced in the reaction of iron(III) nitrate with potassium thiocyanate, a student set a visible light spectrophotometer to measure absorbance of a light with a wavelength of 700 nm (red light). The absorbance value that the student received from the spectrophotometer was too low to be accurately measured (almost zero) by the instrument. Which of these would be the most likely reason for the low reading?
- (A) The concentration of colored ion was too low.
 - (B) A red solution absorbs light only of a complementary color.
 - (C) The solution was too dark in color to absorb light.
 - (D) The concentration of iron solutions cannot be measured with a spectrophotometer.
5. A visible light spectrophotometer would be a suitable instrument to determine
- (A) the elemental composition of the sun by analysis of the light emitted.
 - (B) the wavelength of the light released by a firefly.
 - (C) the concentration of copper ion in a blue solution of $\text{Cu}(\text{NO}_3)_2$.
 - (D) the heat released when 1.0 g of $\text{NaOH}(s)$ is added to 100 g of water.
6. Which of these electron transitions would result in the greatest amount of energy emitted in a hydrogen atom?
- (A) $n = 1$ to $n = 4$
 - (B) $n = 3$ to $n = 4$
 - (C) $n = 4$ to $n = 1$
 - (D) $n = 4$ to $n = 3$
7. How many orbitals are allowed in the $4d$ sublevel?
- (A) 4
 - (B) 5
 - (C) 10
 - (D) 14

8. Which of these wavelengths will produce a wave with the lowest frequency?
- (A) 5.2×10^2 nm
 - (B) 4.0×10^{-6} m
 - (C) 3.5×10^{-5} cm
 - (D) 1.3 \AA ($1 \text{ \AA} = 1 \times 10^{-10} \text{ m}$)



9. Which wave shown above has the highest energy?
- (A) Wave 1
 - (B) Wave 2
 - (C) Wave 3
 - (D) All have the same energy.
10. A beam of red light shining on a piece of gold metal for one second did not cause any electrons to be emitted from the metal. Which is the most probable reason?
- (A) The amplitude of the red light was too low.
 - (B) The light was not shining on the piece of metal for a sufficient time period.
 - (C) The red light had a wavelength that was too short to cause the photoelectric effect.
 - (D) Red light does not have enough energy to remove an electron from the surface of gold.

Answers:

1 (A), 2 (D), 3 (D), 4(B), 5(C), 6 (C), 7 (B), 8 (B), 9 (B), 10 (D)

Practice Questions

Multiple–Choice:

1. This element is paramagnetic, has an ionization energy that is higher than that of carbon, has an atomic radius that is smaller than that of phosphorus and can form an anion with a 2– charge.
 - (A) O
 - (B) N
 - (C) F
 - (D) Cl

2. Which of the following processes is true regarding the formation of a cation from a neutral atom?
 - (A) The cation is larger in size than the neutral atom.
 - (B) It is more difficult to remove an electron from a cation than from a neutral atom.
 - (C) The number of core electrons decreases.
 - (D) The net charge of the species becomes negative.

3. In which of the following elements is the second ionization energy likely to be much greater than the first ionization energy?
 - (A) Argon
 - (B) Rubidium
 - (C) Oxygen
 - (D) Fluorine

4. Which of these characteristics *decreases* with increasing atomic number down a group?
 - (A) Ionization energy
 - (B) Atomic radii
 - (C) Ionic radii
 - (D) Number of energy levels

5. Which group is characterized by high reactivity, formation of both ionic and covalent compounds, and high ionization energy?
- (A) 1A(1)
 (B) 3A(13)
 (C) 4A(14)
 (D) 7A(17)
6. Which of the following is a set of isoelectronic species?
- (A) F_2 , Cl_2 , Br_2
 (B) O, F, Ne
 (C) Na^+ , K^+ , Rb^+
 (D) Na^+ , Ne, F^-
7. Which of these sets is arranged correctly in order of increasing size?
- (A) $I < Br < Cl < F$
 (B) $C < N < O < F$
 (C) $Ne < F^- < O^{2-} < N^{3-}$
 (D) $Fe < Fe^{2+} < Fe^{3+}$

Element	Ionic Radius	Ionization Energy
Calcium	197 pm	590 kJ/mol
Barium	222 pm	503 kJ/mol
Rubidium	248 pm	403 kJ/mol

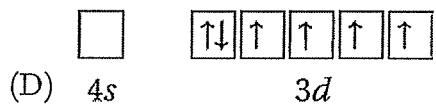
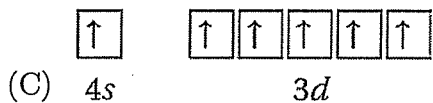
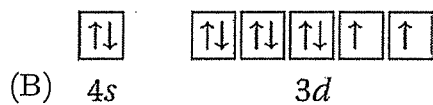
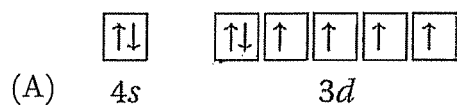
8. Given the data in the table above, which predictions are best for the ionization energy and atomic radius of strontium?

- | <u>Ionic Radius</u> | <u>Ionization Energy</u> |
|---------------------|--------------------------|
| (A) 215 pm | 300 kJ/mol |
| (B) 215 pm | 549 kJ/mol |
| (C) 260 pm | 549 kJ/mol |
| (D) 260 pm | 300 kJ/mol |

9. Which of the following oxides will most likely be amphoteric?

- (A) Na_2O
- (B) MgO
- (C) Al_2O_3
- (D) CO_2

10. Which orbital diagram is correct for a Fe^{2+} ion?



Answers:

1 (A), 2 (B), 3 (B), 4 (A), 5 (D), 6 (D), 7 (C), 8 (B), 9 (C), 10 (D)