

Name _____
October 3, 1994

347K FIRST HOUR EXAM

*Answer the following questions as directed. For multiple choice questions choose the **single best** answer. Multiple choice are worth 3 pts, T/F are worth 1 pt. each.*

1) What is the difference between hardness and toughness (tenacity)? Give an example of a mineral that is hard but not particularly tough, or tough but not particularly hard. (4 pts.)

2) Why aren't all minerals gems and all gems minerals? b) Give an example of a mineral that is not a gem and a gem that is not a mineral.

(4 pts.)

3) If gemstone A is the same size, shape (cut) and weight as gemstone B then we may conclude that

- a) gemstone A and B are the same materials.
- b) gemstone A and B have the same specific gravity.
- c) gemstone A is an imitation of gemstone B.
- d) they are both of equivalent value.
- e) a and b.

4) If cubic zirconia has a specific gravity that is higher than that of diamond, then **identically** cut and faceted diamond and cubic zirconia gemstones will

- a) weigh the same amount because they are cut the same.
- b) weigh different amounts; the diamond will be heavier.
- c) weigh different amounts; the cubic zirconia will be heavier.
- d) weigh different amounts, but which is heavier will depend on how big they are.
- e) weigh the same amount because they have very similar physical properties.

- 5) Crystalline materials differ from amorphous materials by
- containing different chemical elements.
 - having periodic spacing of atoms.
 - being natural rather than man-made.
 - a and b.
 - all of the above.
- 6) Step-cut gemstones can be distinguished from brilliant-cut gemstones by
- the shapes of the facets.
 - the size of the table.
 - whether the crown is domed or flat.
 - the strength of the play-of-color.
 - the number of facets; brilliant cuts have more facets than step cuts.
- 7) Conchoidal fracture is
- common in minerals that contain 2 cleavages.
 - common in minerals that contain 1 cleavage.
 - common in minerals that do not have a cleavage.
 - a fracture pattern that looks like splintered wood.
 - restricted to minerals that have high specific gravities.
- 8) Cleavage and parting are two physical properties that affect a gem or minerals'
- toughness
 - hardness
 - durability
 - a and c
 - all of the above.
- 9) A Mohs hardness of 7 is often considered the minimum for jewelry gemstones because softer gems
- break too easily.
 - can't be polished.
 - are too easily scratched.
 - a and c
 - all of the above.
- 10) Which of the following is correctly arranged by hardness?
- Corundum, topaz, orthoclase, quartz
 - Fluorite, orthoclase, quartz, topaz.
 - Quartz, corundum, topaz, diamond.
 - Diamond, corundum, quartz, topaz.
 - Talc, gypsum, fluorite, calcite.
- 11) A gemstone that floats on top of a heavy liquid has a specific gravity that is
- the same as the liquid.
 - greater than the liquid.
 - less than the liquid.
 - greater than or less than the liquid, depending on size of the gemstone.
 - none of the above

- 12) A mineral's luster is a physical property that depends on the
- a) diffraction of light from the mineral's surface.
 - b) the reflection of light from the minerals surface.
 - c) the absorption of different wavelengths of light at the minerals surface.
 - d) the presence or absence of a chromophore.
 - e) the emission of light after some light is absorbed.
- 13) Asterism is caused by
- a) the presence of more than one chromophore.
 - b) randomly arranged, reflective mineral inclusions.
 - c) color centers.
 - d) diffraction in more than one direction.
 - e) none of the above
- 14) Tiger's eye or gems that display a cat's eye exhibit a phenomenon called
- a) asterism
 - b) chatoyance
 - c) play-of-color
 - d) aventurescence
 - e) none of the above
- 15) To see the green color in an emerald, the Cr present must absorb the
- a) green part of the visible spectrum.
 - b) red and violet parts of the visible spectrum.
 - c) red part of the visible spectrum.
 - d) blue part of the visible spectrum.
 - e) yellow part of the visible spectrum.
- 16) Gem labradorite feldspar and opal owe their unique color displays to
- a) aventurescence.
 - b) color centers
 - c) fluorescence.
 - d) transition metal chromophores
 - e) diffraction
- 17) Play-of-color is a term used to describe
- a) different colors caused by many different chromophores.
 - b) the difference between hue and tone.
 - c) flashes of color in opal.
 - d) aventurescence in sunstone.
 - e) a particularly vibrant Broadway show.
- 18) Aventurescence is a phenomenon caused by
- a) reflective mineral inclusions.
 - b) fluorescence in moonstone.
 - c) diffraction.
 - d) color centers.

- 19) Fluorescence of a gem in ultraviolet light is a result of
- a) the emission of ultraviolet light.
 - b) dispersion.
 - c) diffraction.
 - d) the absorption of visible light.
 - e) the absorption of ultraviolet light and the emission of visible light.
- 20) Color in allochromatic minerals and gems is
- a) a diagnostic property that can aid in mineral or gem identification.
 - b) caused by chromophores that are present in great abundance.
 - c) not a diagnostic property for identification purposes.
 - d) caused by reflection from randomly arranged mineral inclusion.
 - e) none of the above.
- 21) Color centers are the source of color in minerals that
- a) contain transition elements.
 - b) are ideochromatic.
 - c) are capable of diffracting light.
 - d) contain crystal lattice defects.
 - e) are fluorescent.
- 22) Absorption of light by chromophores to produce color occurs
- a) within the nucleus of the chemical element that is the chromophore.
 - b) by moving a proton from one type of orbital to another.
 - c) when atoms can move from one site within a crystal to another, absorbing energy.
 - d) by the movement of electrons.
 - e) by diffraction.
- 23) Transition elements are uniquely suited to act as chromophores because they
- a) contain electrons in partially filled d-orbitals
 - b) are electrically neutral.
 - c) are the most common elements in nature.
 - d) are highly mobile in crystals.
 - e) all of the above.
- 24) A gem or mineral that is red absorbs
- a) red light.
 - b) mostly red light.
 - c) most wavelength of the visible spectrum except red.
 - d) more of the visible spectrum than a gem or mineral that is violet.
 - e) less of the visible spectrum than a colorless gem.
- 25) Gems and minerals whose color can be altered by high energy forms of radiation are colored by
- a) color centers
 - b) diffraction
 - c) transition elements
 - d) play-of-color
 - e) none of the above

- 26) In crystallography, a *form* is defined as
- a) the habit of the mineral.
 - b) a group of identical crystal faces.
 - c) a group of crystal faces with adjoining edges.
 - d) a specific type of symmetry element.
 - e) an incomplete crystal.
- 27) The internal arrangement of atoms in crystalline materials is reflected in the external shapes of crystals by
- a) the angles between crystal faces.
 - b) the symmetry of crystal faces.
 - c) the shape of the smallest, imaginary "building block" needed to construct the crystal.
 - d) all of the above.
- 28) The symmetry of crystal faces with respect to a line, plane and/or point can be used to classify crystals into
- a) crystal habits.
 - b) closed or open crystal forms.
 - c) crystal interfacial angles.
 - d) crystal systems.
 - e) none of the above.
- 29) The hexagonal crystal system differs from all others in being composed of a unit cell that
- a) has 4 imaginary axes.
 - b) has a long c-axis.
 - c) is smaller than all the others.
 - d) has sides that are not at right angles.
 - e) has 6 faces.
- 30) The isometric (cubic) crystal system is characterized by having
- a) 3 crystallographic axes of equal length.
 - b) 4 crystallographic axes of unequal length.
 - c) no crystallographic axes perpendicular.
 - d) no crystallographic axes of equal length.
 - e) 3 crystallographic axes of unequal length.
- 31) Minerals that form crystals that fall within the tetragonal crystal system can
- a) also form crystals of the isometric system.
 - b) grow crystals of different shapes, but all the crystals will still have the symmetry of the tetragonal system.
 - c) also form crystal that have symmetries appropriate to any of the crystal systems.
 - d) show nearly an infinite variety of symmetries.
 - e) have only a center of symmetry.
- 32) Most common gem minerals are members of the
- a) isometric, tetragonal and hexagonal crystal systems
 - b) monoclinic and triclinic systems
 - c) orthorhombic and isometric systems
 - d) isometric system
 - e) orthorhombic system

- 33) Prism and pinacoids are types of
- a) open forms
 - b) crystalline solids
 - c) symmetry operators
 - d) crystallographic axes
 - e) closed forms
- 34) Hue is the term used to describe the
- a) amount of brown or gray present in a color
 - b) vibrancy of a color
 - c) color present (red, blue, green, etc.)
 - d) darkness or lightness of the color
 - e) none of the above.

Answer the following questions True or False.

- 35) ____ White is seen when all wavelengths of the visible spectrum are absorbed.
- 36) ____ Opal with well-organized spherical molecules of the proper size and spacing will show play-of-color.
- 37) ____ The crown facets on a gemstone are below the girdle.
- 38) ____ Ideochromatic gems, in their purest form, are colorless.
- 39) ____ There are 5 grams in one carat.
- 40) ____ Allochromatic materials, in their purest forms, are colorless.
- 41) ____ Chromium can produce different colors in different minerals.
- 42) ____ All crystalline materials belong to one of the 5 crystal systems.
- 43) ____ A rhombohedron is an example of a closed form.
- 44) ____ S-, p-, and d-orbitals are location where light is absorbed in elements that are chromophores.
- 45) ____ Brilliant-cut gemstones can be distinguished from step-cut gemstones by the shapes of the facets.
- 46) ____ An adamantine luster is less lustrous than a vitreous luster.