

חיידון המדע הירושלמי תשס"ח - 2008-2009 Jerusalem Science Contest
Electromagnetic and Ionizing radiation
Exam 3 — Chapter 28a; Reflection

Name: _____

Date: _____

Raw Score: _____

Percentage Score: _____ %

Proctor for this Examinaton: _____ Form: _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Fermat's Principle of Least Time applies to
 - A) reflected light
 - B) refracted light
 - C) defracted light
 - D) all light
 - E) none of the preceding

- 2) If light from an object strikes the surface of a plane mirror and is reflected
 - A) a real, upright image is formed in front of the mirror
 - B) a real, upright image is formed behind the mirror
 - C) a virtual, upright image is formed in front of the mirror
 - D) a virtual, inverted image is formed behind the mirror
 - E) a real inverted image is formed in front of the mirror

- 3) The most reflective mirrors still transmit about what percentage of incident light?
 - A) 0.1%
 - B) 1%
 - C) 5%
 - D) 10%
 - E) 20%

- 4) A laser beam strikes a plane mirror at a 60° angle from the normal. At what angle from the normal is the reflected beam?
 - A) 30
 - B) 45
 - C) 60
 - D) 75
 - E) 90

- 5) What happens to the frequency of light upon reflection?
 - A) It remains unchanged
 - B) It increases
 - C) It decreases
 - D) It increases for convex mirrors and decreases for convex mirrors
 - E) It inceases for concave mirrors and decreases for convex mirrors

- 6) What type of reflection occurs from smooth, shiny surfaces?
 - A) specular
 - B) circularly polarized
 - C) diffuse
 - D) EM polarized
 - E) none of the preceding

- 7) An image formed by rays that appear to come from a point behind a mirror is known as a(n) _____ image.
- A) imaginary
 - B) true
 - C) real
 - D) virtual
 - E) none of the preceding
- 8) In the mirror equation $1/p + 1/q = 2/R$, the variable R is known as the
- A) reflectance
 - B) refractive index
 - C) resolution
 - D) radius of curvature
 - E) none of the preceding
- 9) What does the quantity 'p' represent in the mirror equation $1/p + 1/q = 2/R$?
- A) image distance
 - B) object distance
 - C) focal length
 - D) magnification
 - E) none of the preceding
- 10) What does the quantity 'q' represent in the following equation: $1/p + 1/q = 2/R$?
- A) image distance
 - B) object distance
 - C) focal point
 - D) magnification
 - E) none of the preceding
- 11) What kind of reflection occurs when light strikes a surface that has a rough texture?
- A) specular
 - B) circularly polarized
 - C) diffuse
 - D) EM polarized
 - E) none of the preceding
- 12) A spherical concave mirror has a radius of curvature of 2.50 m. How far away from the mirror is the focal point?
- A) 1.25 m
 - B) 5.00 m
 - C) 6.25 m
 - D) 0.50 m
 - E) none of the preceding
- 13) For a concave mirror with an object at infinity (i.e. very far away from the mirror), the image will be
- A) real, and appear at the focal point.
 - B) virtual, and appear at the focal point.
 - C) real, and appear in front of the focal point (i.e. closer to the mirror than the focal point is).
 - D) virtual, and appear behind the focal point (further away from the mirror than the focal point).
 - E) non-existent (no image will be formed).

- 14) For an object placed at a distance from a concave mirror that is greater than the center of curvature distance, the image will be
- A) closer to the mirror than the focal point distance, real and with a magnification >1 .
 - B) real, further away from the mirror than the center of curvature distance, inverted, and with a magnification of >1 .
 - C) real, inverted, between the center of curvature and the focal point, with a magnification of <1 .
 - D) non-existent (no image will be formed).
 - E) virtual, with a magnification of >1 .
- 15) An object placed at the center of curvature of a concave mirror will form an image that is
- A) real, inverted and with a magnification of 1 (i.e. unmagnified).
 - B) real, further away from the mirror than the center of curvature distance, inverted, and with a magnification of >1 .
 - C) real, inverted, between the center of curvature and the focal point, with a magnification of <1 .
 - D) virtual, with a magnification of >1 .
 - E) non-existent (no image will be formed).
- 16) An object placed between the center of curvature and the focal point of a concave mirror will form an image that is
- A) real, inverted and with a magnification of 1 (i.e. unmagnified).
 - B) real, further away from the mirror than the center of curvature distance, inverted and with a magnification of >1 .
 - C) real, inverted, between the center of curvature and the focal point, with a magnification of <1 .
 - D) virtual, with a magnification of >1 .
 - E) non-existent (no image will be formed).
- 17) An object closer to a concave mirror than the focal distance will form an image that is
- A) real, inverted and with a magnification of 1 (i.e. unmagnified).
 - B) real, further away from the mirror than the center of curvature distance, inverted, and with a magnification of >1 .
 - C) real, inverted, between the center of curvature and the focal point, with a magnification <1 .
 - D) virtual, with a magnification of >1 .
 - E) non-existent (no image will be formed).
- 18) An object placed at the focal point of a concave mirror will form an image that is
- A) real, inverted and with a magnification of 1 (i.e. unmagnified).
 - B) real, further away from the mirror than the center of curvature distance, inverted, and with a magnification of >1 .
 - C) real, inverted, between the center of curvature and the focal point, with a magnification <1 .
 - D) virtual, with a magnification of >1 .
 - E) non-existent (no image will be formed).
- 19) For any convex spherical mirror the image will always be
- A) real, upright, with a magnification of <1
 - B) real, inverted, with a magnification of >1
 - C) virtual, upright, with a magnification of <1 .
 - D) virtual, inverted, with a magnification of >1
 - E) none of the preceding

- 20) An upright pencil is placed in front of a concave spherical mirror having a focal length of 10.0 cm. If the pencil is 12.0 cm in length and is placed on the principal axis 30.0 cm from the mirror, what is the size of the image that is formed?
- A) 2.5 cm
 - B) 6.0 cm
 - C) 12.0 cm
 - D) 18.0 cm
 - E) no image is formed
- 21) Given the parameters of problem 20, how far along the principal axis from the mirror is the image located?
- A) 15 cm
 - B) 10 cm
 - C) 12 cm
 - D) 30 cm
 - E) no image is formed
- 22) Which of the following describes the image formed in problem 20
- A) real, upright
 - B) real, inverted
 - C) virtual, upright
 - D) virtual, inverted
 - E) no image is formed
- 23) Ghost images in TV reception are caused by
- A) electromagnetic interference from sunspots
 - B) poltergeists
 - C) interference from signals reflected off of buildings or other obstructions, causing a delay in the reflected signal
 - D) reflection of signals off of clouds, causing a delay in the reflected signal
 - E) none of the preceding
- 24) A submerged beam of light is passed through a container of water so that it strikes the surface of water at an angle normal to the surface. Some of the light is transmitted through the air and some is reflected back into the water. As the beam is moved away from a position normal to the surface, eventually an angle will be reached at which all of the light is reflected into the water and none is transmitted through the air. This angle is called
- A) Brewster's angle
 - B) the reflective maximum angle
 - C) the critical angle
 - D) the angle of refraction
 - E) none of the preceding
- 25) Optical fibers or light pipes enable light to bend around a corner because of
- A) diffuse reflection
 - B) total internal reflection
 - C) Rayleigh scattering
 - D) specular reflection
 - E) none of the preceding