Name:_____ ID: _____

1. Imagine yourself standing in front of a plane mirror. You then start to walk towards the mirror at 1.8 ms^{-1}. How fast will your image in the mirror will approach you?

(A) 1.8 ms^{-1} (B) 3.6 ms^{-1}

(C) 0.9 ms^{-1} (D) 4.5 ms^{-1}

2. A concave mirror forms the image of a **very distant** object at 18.0 cm on the same side of its reflecting surface. What is the focal length of this mirror?

(A) + 36.0 cm (B) + 18.0 cm

(C) - 18.0 cm (D) - 36.0 cm

3. An extended object is placed at the focal point of a convex lens. The image formed by this lens will be located at

(A) ∞ (B) another focal point

(C) 2 f (D) need more information

4. The spherical side mirror on a car is convex and has a radius of curvature of 25 cm. Another car is following, 20 m behind the mirror. If the height of the car is 1.6 m, how tall is its image?

(A) 5.0 cm (B) 2.0 cm

(C) 4.0 cm (D) 0.99 cm

5. A swimming pool is filled to a depth of 2.0 m. How deep does the pool appear to be from above the water, which has an index of refraction of 1.33?

(A) 1.5 m (B) 1.33 m

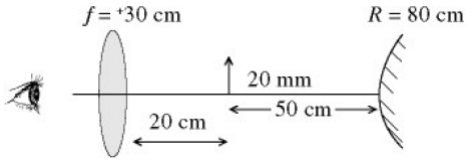
(C) 2.5 m (D) 1.5 cm

6. A person can read the newspaper when it is held at 60 cm from his eyes. What should the focal length of his contact lenses be to allow him to read the newspaper comfortably at a distance of 30 cm?

(A) - 30 cm (B) 60 cm

(C) - 60 cm (D) 30 cm

7. An optical system shown in the figure comprises in turn, from left to right: an observer, a lens of focal length +30 cm, an erect object 20 mm high, and a convex mirror of radius 80 cm. The object is between the lens and the mirror, 20 cm from the lens and 50 cm from the mirror. The observer views the image that is formed first by reflection and then by refraction. What is the position of the final image, measured from the mirror?



(A) 114 cm (B) 102 cm

(C) 90 cm (D) 126 cm

8. In the figure below, the radius of curvature of the curved part of the lens is 35.0 cm, and the refractive index of the lens material is 1.620. What is the focal length of the lens?

(A) - 56.5 cm (B) + 56.5 cm

(C) + 21.6 cm (D) - 21.6 cm

9. Light from a monochromatic source shines through a double slit onto a screen 5.00 m away. The slits are 0.180 mm apart. The dark bands on the screen are measured to be 1.70 cm apart. What is the wavelength of the incident light?

(A) 612 nm (B) 457 nm

(C) 306 nm (D) 392 nm

10. Monochromatic light of certain frequency strikes a metal surface and electrons are ejected from the metal. If the intensity of the light is increased, what will happen to the ejection rate and maximum kinetic energy of the electrons? (The upward pointing arrow indicates "increase")

(A) same ejection rate; max. energy ↑ (B) ejection rate ↑; same max. energy

(C) ejection rate ↑; max. energy ↑ (D) same ejection rate; same max. energy

11. Upon being struck by 240-nm photons, a metal ejects electrons with a maximum kinetic energy of 1.45 eV. What is the work function of this metal?

(A) 3.73 eV (B) 3.13 eV

(C) 4.33 eV (D) 4.92 eV

12. The energy of the ground state in the Bohr model of the hydrogen atom is -13.6 eV. In a transition from the n = 2 state to the n = 4 state, a photon of energy

(A) 3.40 eV is emitted (B) 3.40 eV is absorbed

(C) 2.55 eV is emitted (D) 2.55 eV is absorbed

13. When light shines through atomic hydrogen gas, it is seen that the gas absorbs light readily at a wavelength of 91.63 nm. What is the value of the principal quantum number n of the level to which the hydrogen is being excited by the absorption of light of this wavelength? Assume that the most of the atoms in the gas are in the lowest level.

(A) 14 (B) 16

(C) 11 (D) 21

14. A photon of wavelength 18.0 pm is scattered through an angle of 120° by a stationary electron. What is the wavelength of the scattered photon?

(A) 19.2 pm (B) 20.4 pm

(C) 21.6 pm (D) 22.9 pm

15. The energy of the electron in Hydrogen atom can be shown to be given by $E_n = -13.6/n^2$ eV, where n represents the principal quantum number. Imagine a situation where the electron makes a transition from $n = 3$ to $n = 1$ state. Where does the photon emitted in this transition lie in the electromagnetic spectrum?

(A) visible region (B) Infra-red region

(C) Ultra-violet region (D) X-ray region