Dangers and Uses of Electromagnetic Radiation

Low Energy ↓ **ENERGY** ↑ High Energy

Low Frequency ↓ **FREQUENCY** ↑ High Frequency

Long Wavelength ↓ **WAVELENGTH** ↑ Short Wavelength

Type of Radiation	Uses and/or Dangers
Gamma Rays	– very dangerous radiation, cancer causing, radiation poisoning – gamma ray knife used for brain surgery, radiation therapy to cure cancer
X-Rays	– dangerous radiation, cancer causing – used for medical imaging – used to test critical metal structures for weakness
Ultraviolet Light	– dangerous radiation, causes skin cancer and sunburns – used to initiate some chemical processes
Visible Light	– good to see with!
Infrared	– only dangerous in high concentrations – provides heat (heat radiant energy)
Microwaves	– only dangerous at specific wavelengths – used for microwave ovens – used for telecommunications
Radiowaves	– used for telecommunications (TV, radio, satellite signals, cell phones, satellite phones, GPS signals)

Provide definitions for each of the following terms:

- incandescent light source (give examples): any light source that produces light because it is hot, stove plate, sun, your (visible in the infrared)

- fluorescence: energy is absorbed by a chemical, produces an excited chemical state that then gives off light are returns to a low energy state, happens quickly, does not involve heat

- phosphorescence: same fluorescence by happens much more slowly

- chemiluminescence: any chemical reaction that produces light, will be a cool light source, glow sticks

- bioluminescence: any chemiluminescent process that happens in a living thing, fireflies

- converging vs diverging rays: converging rays come together to a point, diverging rays spread outwards from a point

What is the colour temperature relationship for incandescent light sources?

- the colour depends on the temperature, as the temperature increases the colour goes from:

red ➜ orange ➜ yellow ➜ white ➜ blue ➜ violet

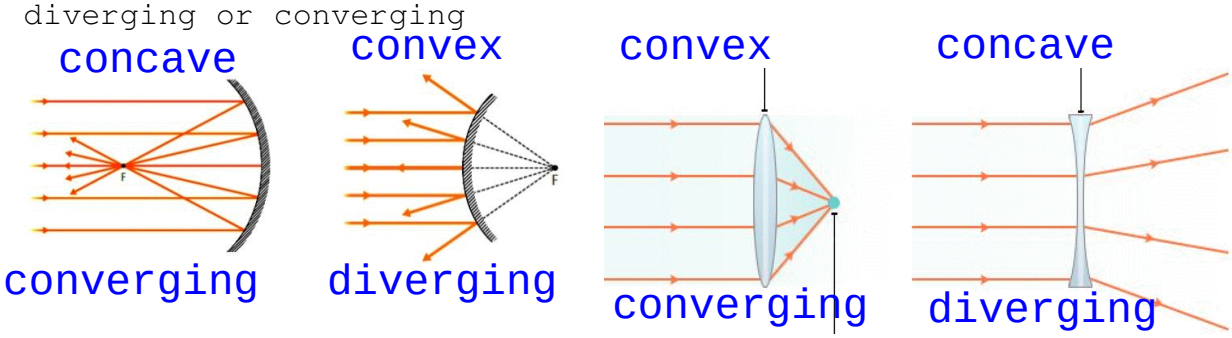
Provide definitions for each of the following terms:

- incandescent light source (give examples): hot, therefore glows (like a poker in the fire)
  stove plate, sun, stars, incandescent light bulb
- fluorescence: elevated electronic state relaxes and gives of photon of light
  excite -> relax -> light passport
- phosphorescence: like fluorescence but slower
  excite -> wait (time delay) -> relax -> light
  glow in the dark stickers
- chemiluminescence: any light from a chemical reaction that is not due to heat, cool chemical reaction
  glow stick
- bioluminescence: chemiluminescent reaction in biological organism
  fireflies, angler fish
- converging vs diverging rays:
  come together go apart

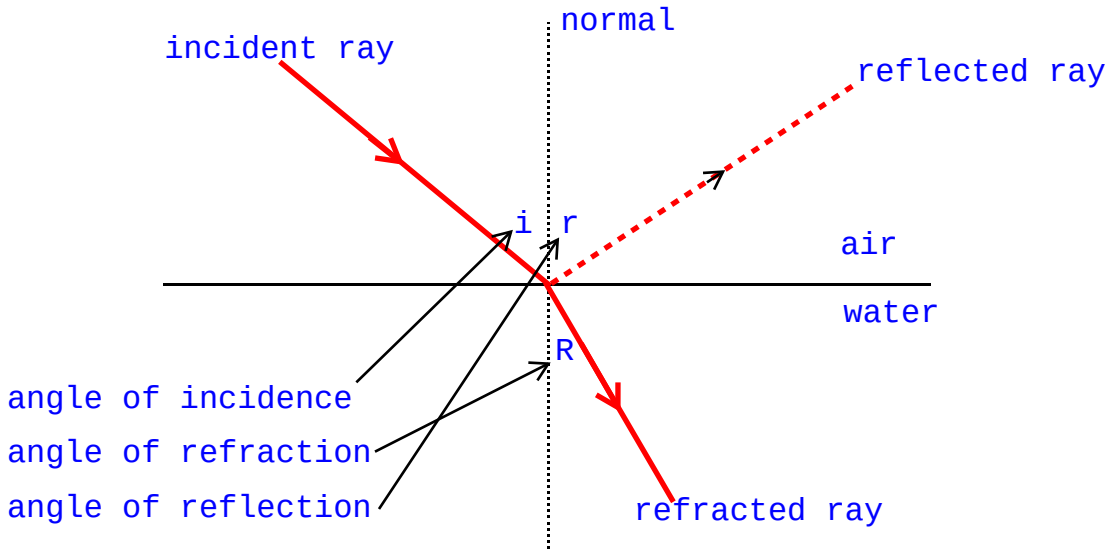
What is the colour temperature relationship for incandescent light sources?

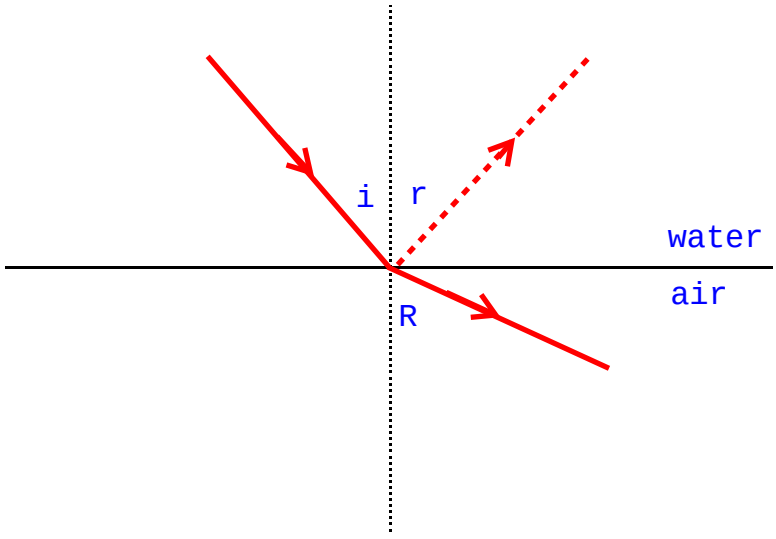
colour depends on temperature
red -> orange -> yellow -> white -> blue -> violet
coolest to hottest

Label each mirror or lens as either concave or convex **AND** diverging or converging



Draw two diagrams that illustrate the principle of refraction. The first diagram should be for a ray of light travelling from air to water (from less optically dense to more optically dense). The second diagram should be for a ray of light travelling from water to air (from more optically dense to less optically dense). Label completely! Which way does the ray bend???





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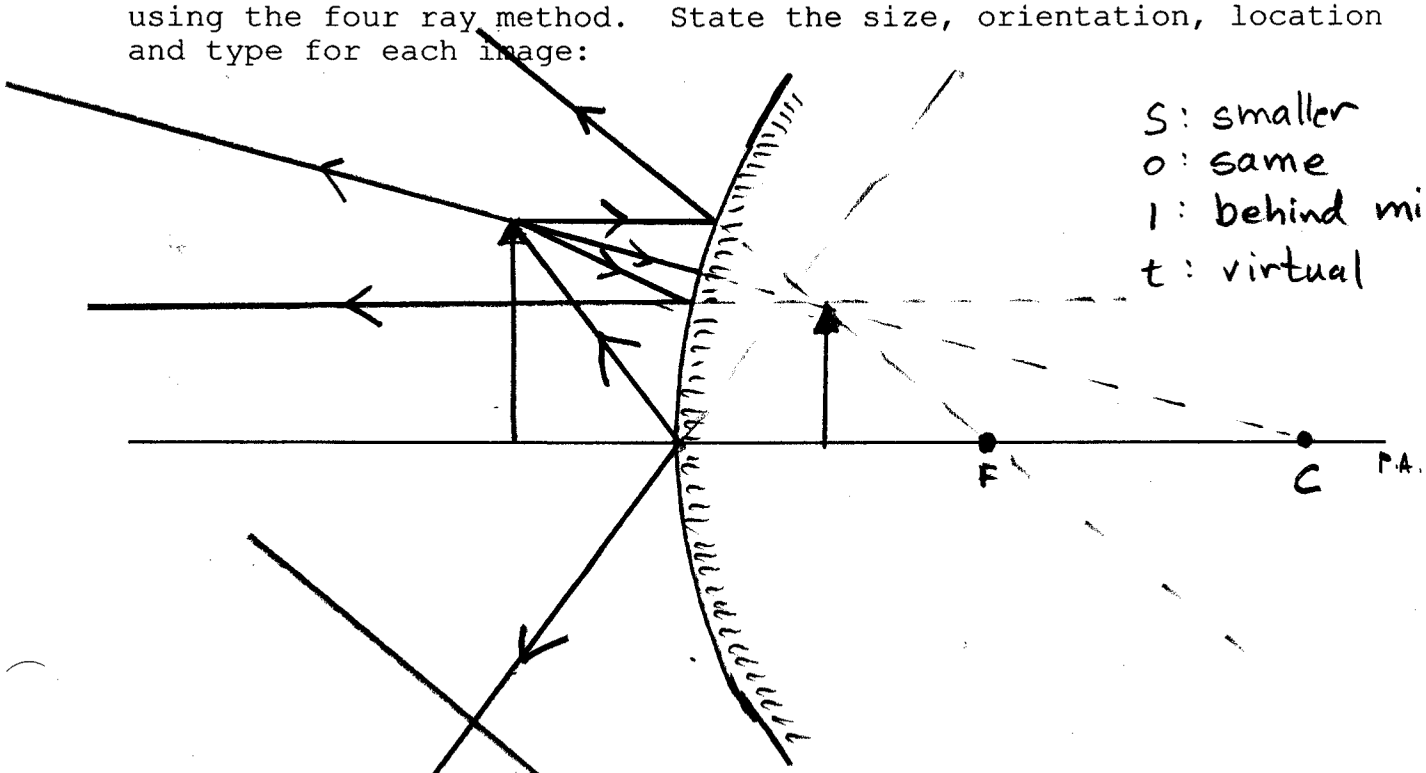
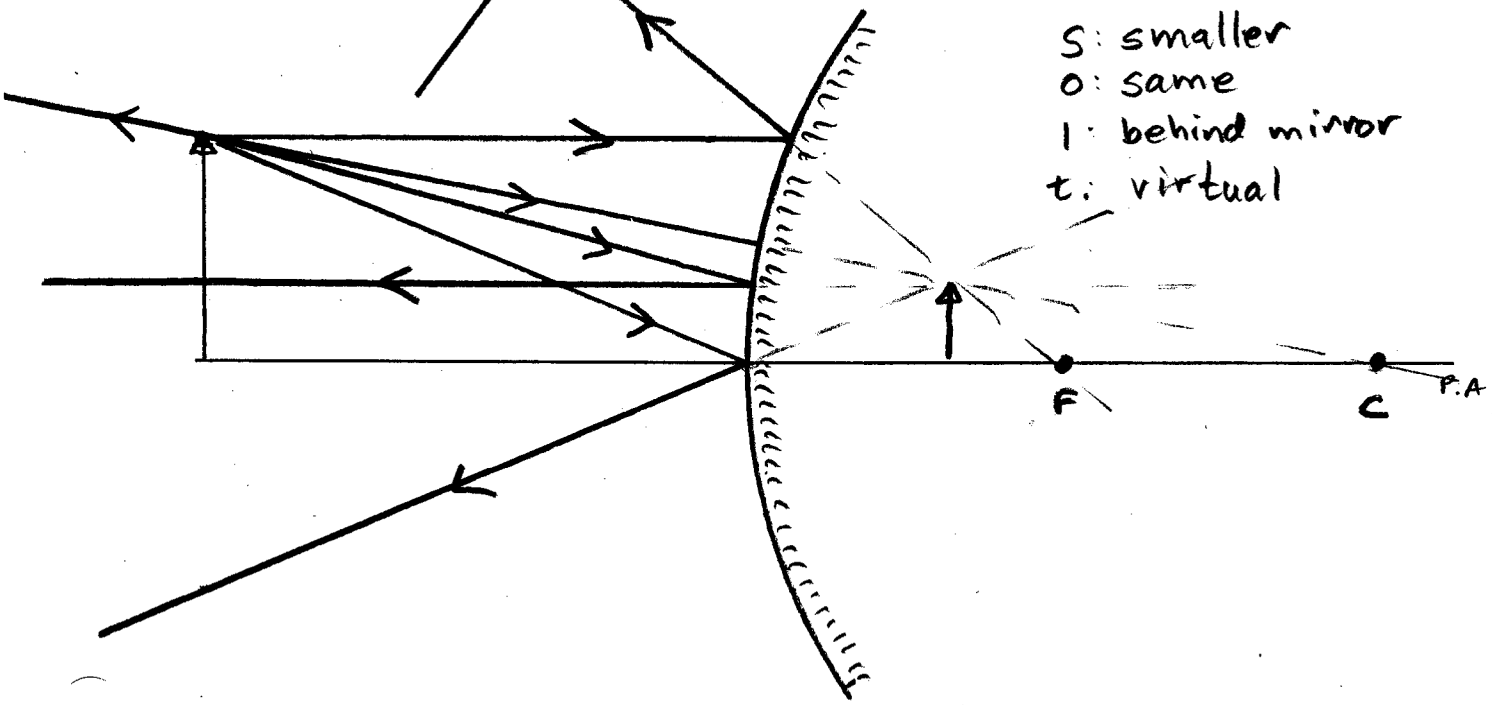
Convex Mirror Ray Diagrams

For each of the following objects, draw and locate the image using the four ray method. State the size, orientation, location and type for each image:

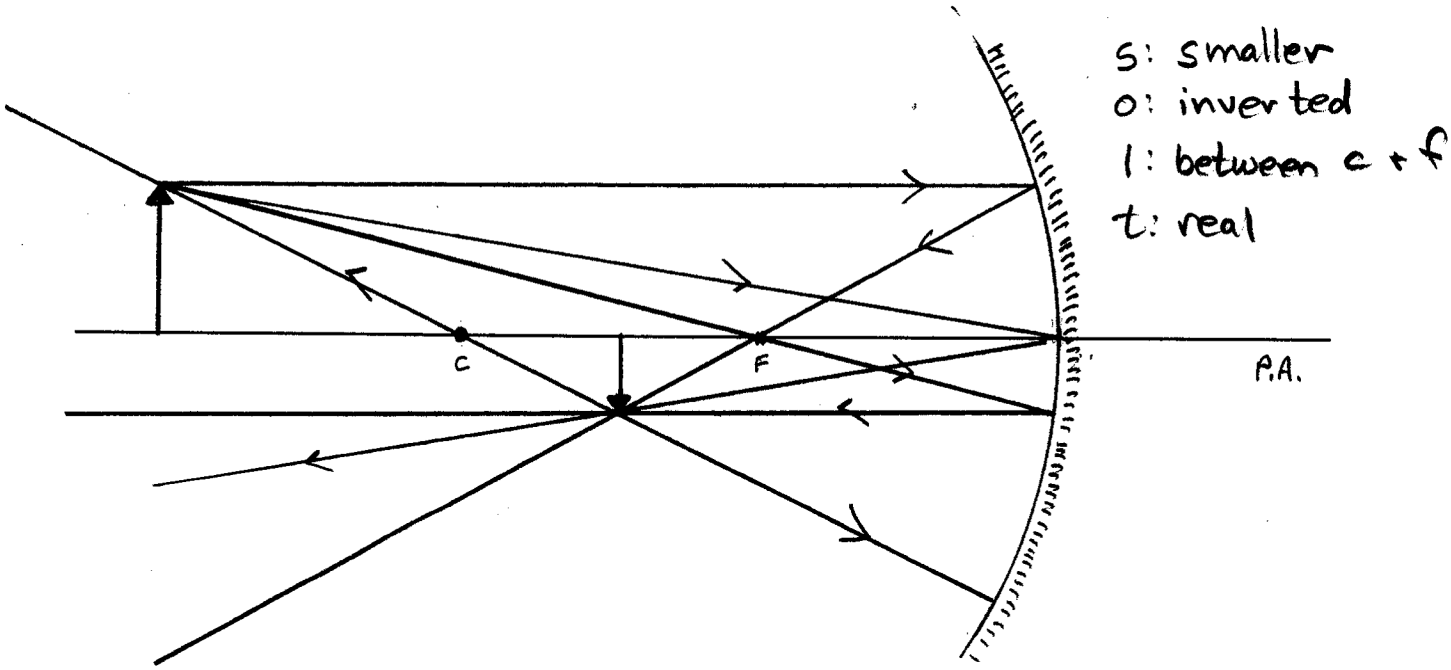




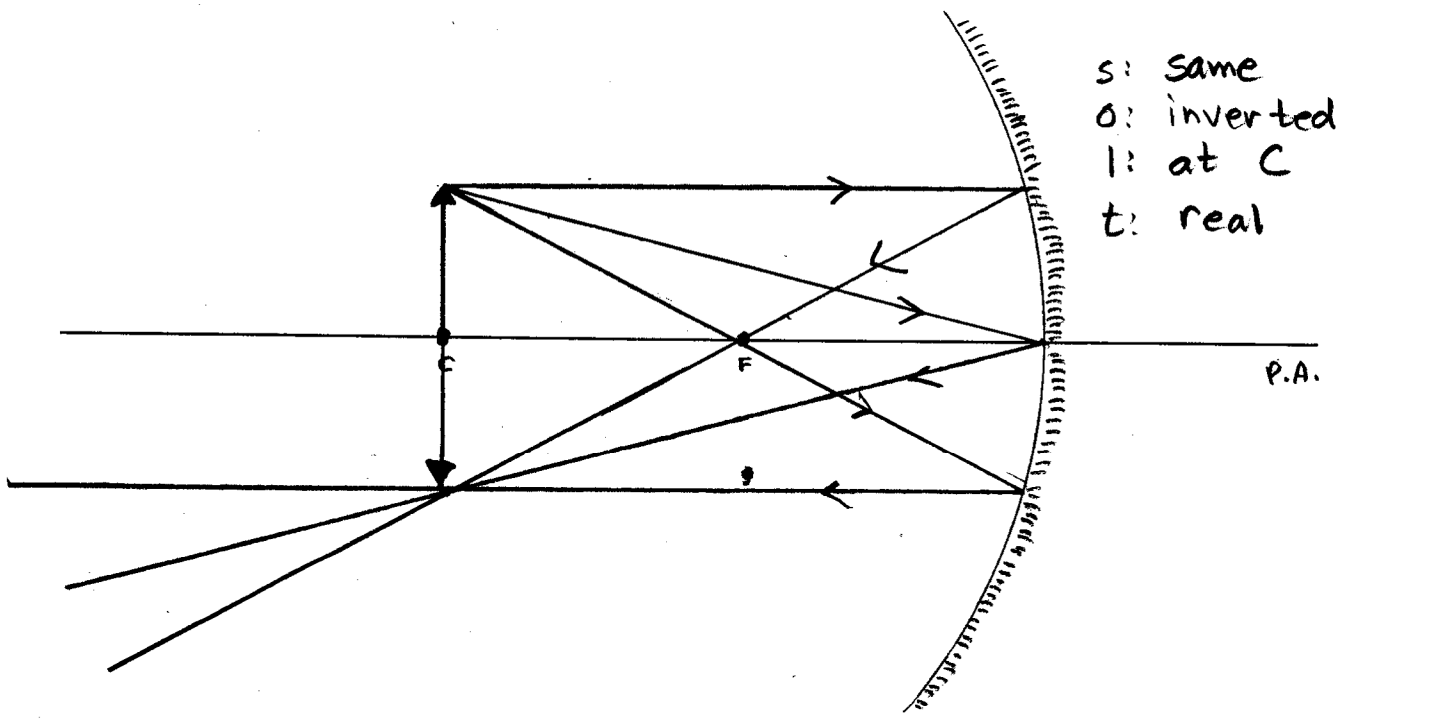
Name:_____

Concave Mirror Ray Diagrams

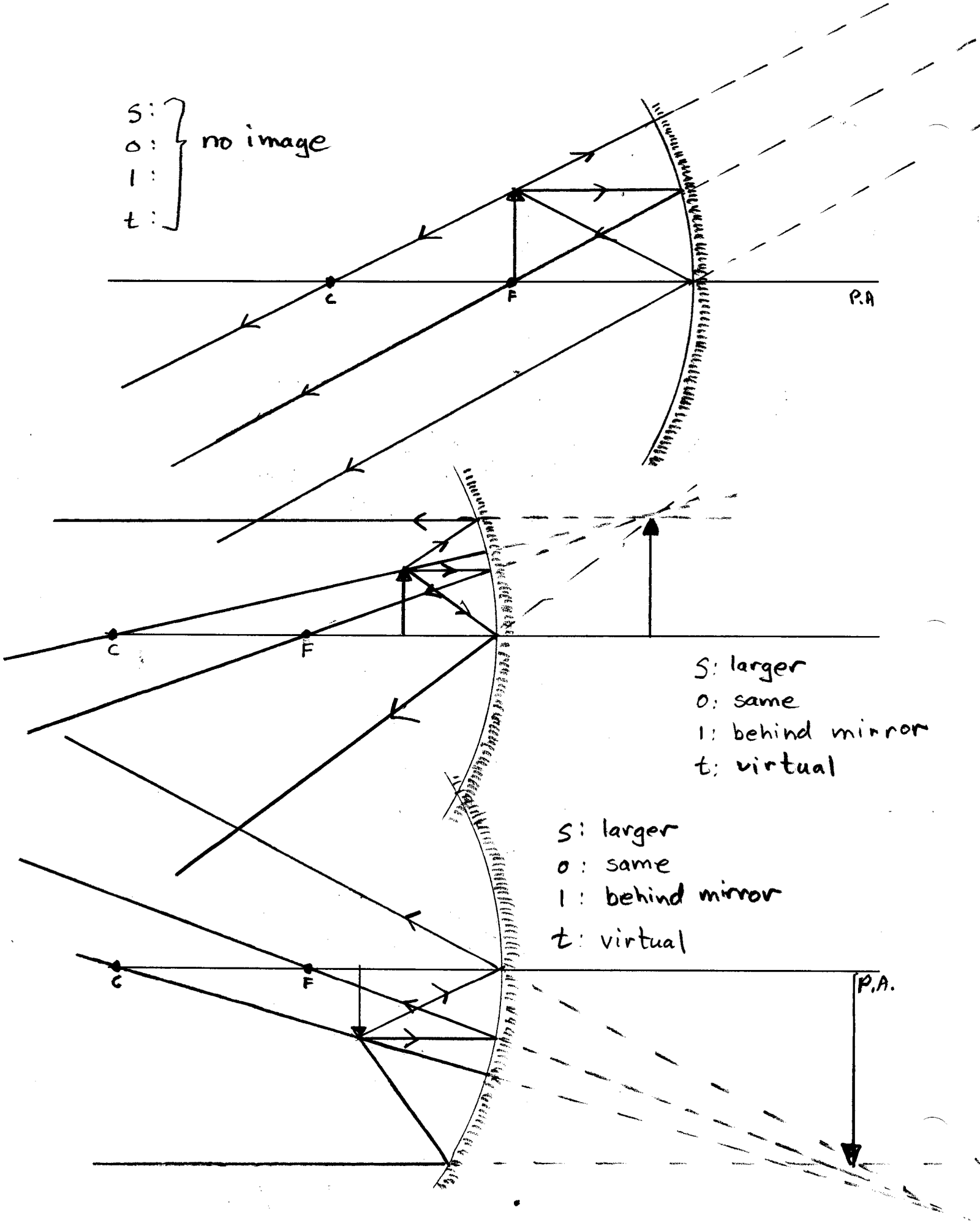
For each of the following objects, draw and locate the image using the four ray method. State the size, orientation, location and type for each image:



s: smaller
o: inverted
l: between c + f
t: real

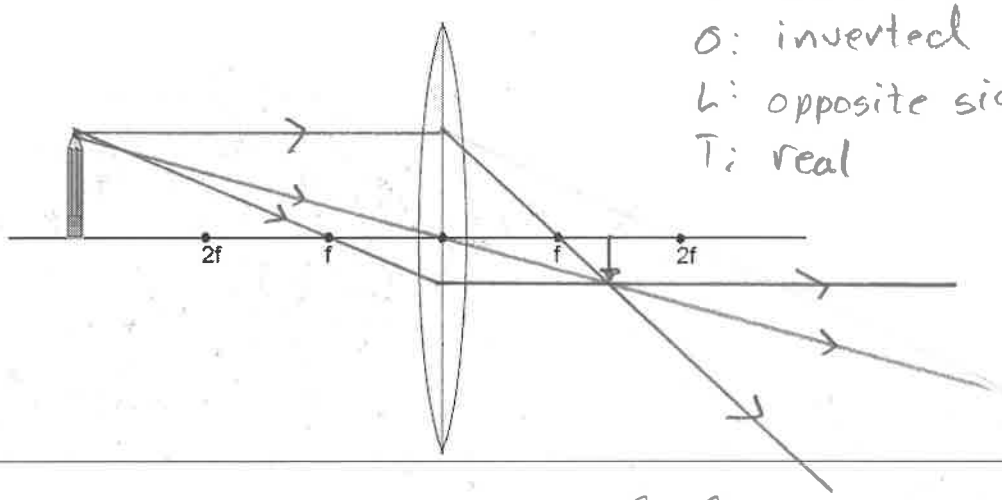


s: same
o: inverted
l: at C
t: real


S:
o:
I:
t:
no image
C
F
P.A
C
F
S: larger
o: same
I: behind mirror
t: virtual
S: larger
o: same
I: behind mirror
t: virtual
C
F
P.A.

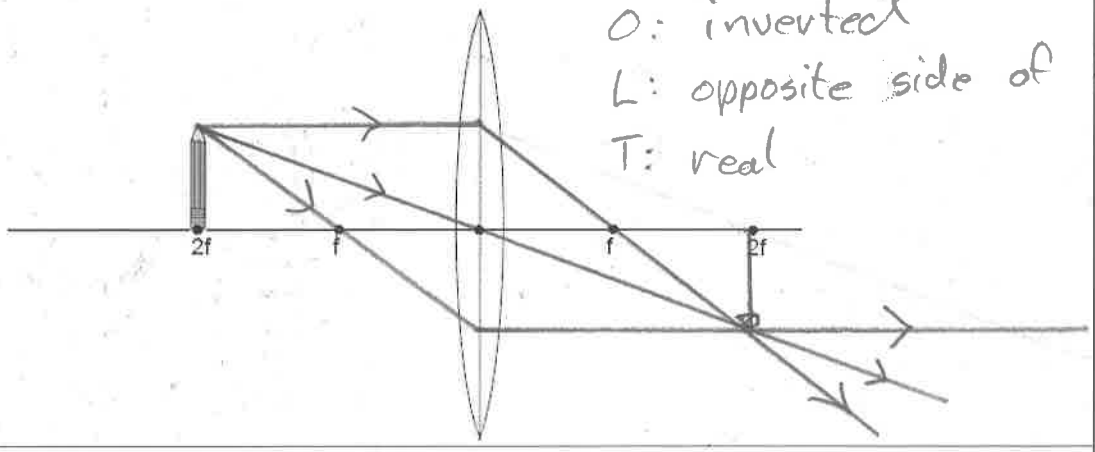
Converging & Diverging Lenses Ray Diagrams

(1)



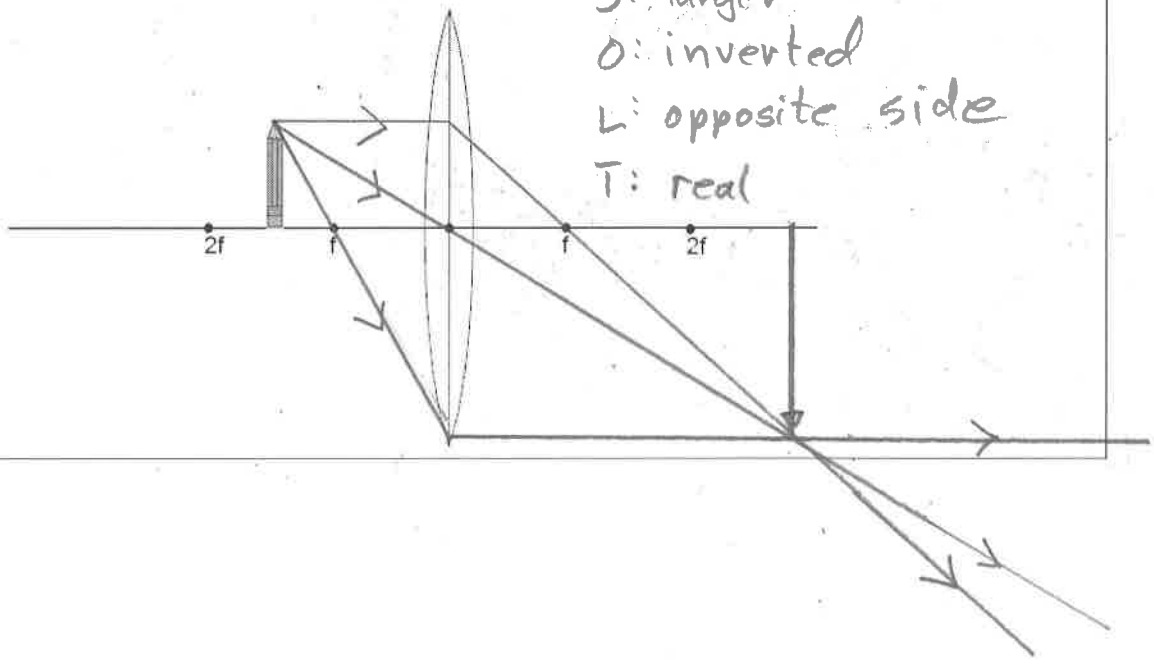
S: smaller
O: inverted
L: opposite side of lense
T: real

(2)



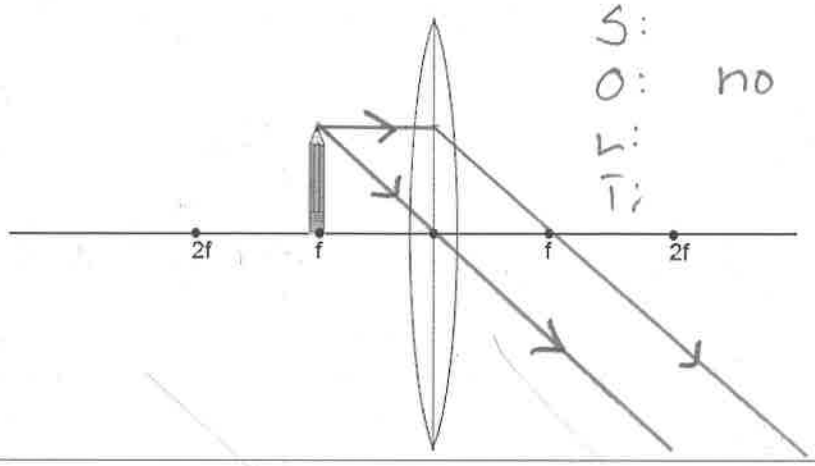
S: same
O: inverted
L: opposite side of lense
T: real

(3)



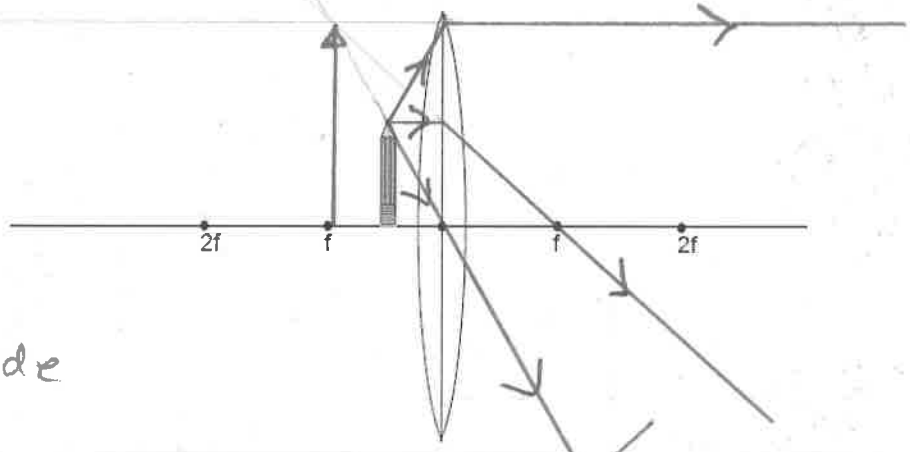
S: larger
O: inverted
L: opposite side
T: real

(4)



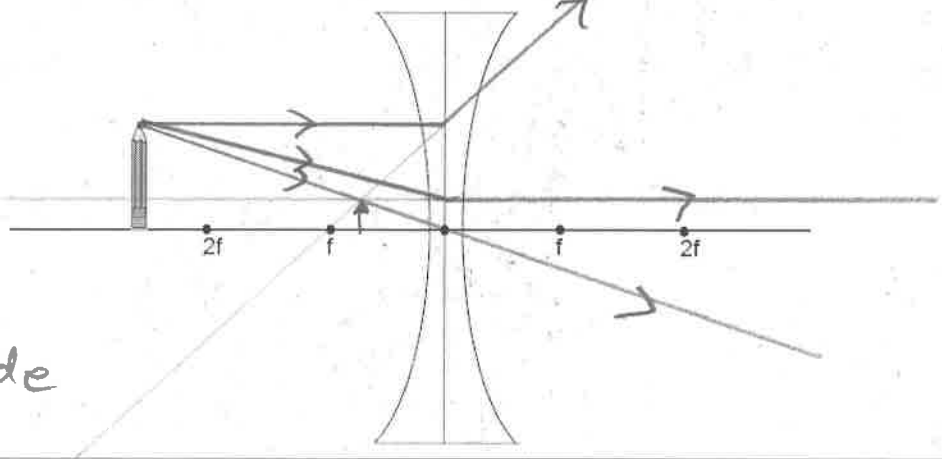
S:
O: no image
L:
T:

(5)



S: larger
O: same
L: same side
T: virtual

(6)



S: smaller
O: same
L: same side
T: virtual