SNC 2D: Light & Optics Name: _____

Date: _____

Light & Optics Unit Review

1. What is **light**? Include at least 4 facts or ideas in your explanation.
2. Describe **electromagnetic waves**.
3. What is the **electromagnetic spectrum**?
4. List 2-3 uses for each **type** of **electromagnetic wave**.
    a) Radio waves
    b) Microwaves
    c) Infrared light
    d) Visible light
    e) Ultraviolet light
    f) X-rays
    g) Gamma rays

5. Write the correct **term** next to each **description**.

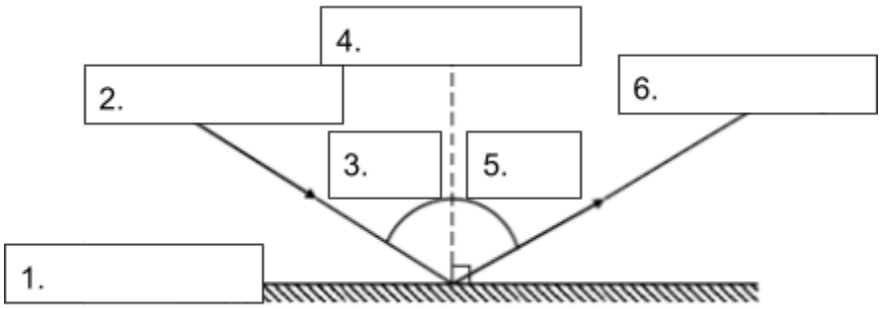
Definition	Term	Terms
a. Object that **no light** can pass through		Photon Visible light Luminous Non-luminous Transparent Translucent Opaque
b. The **electromagnetic waves** that the **human eye** can detect		
c. Objects that **produce** their own **light**		
d. Object that lets **some light** pass through		
e. Discrete packets of **energy** that carry **momentum**, have **no mass**, and travel at the speed of light		
f. Object that lets almost **all light** pass through		
g. Objects that can be seen when light **reflects** off them		

6. Describe each method of producing light in 6 words or less.

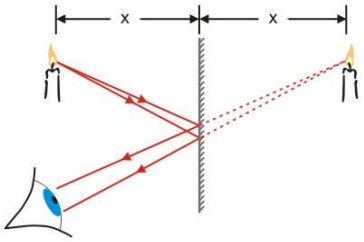
    a) Incandescence
    b) Electric discharge
    c) Phosphorescence
    d) Fluorescence
    e) Chemiluminescence
    f) Bioluminescence
    g) Triboluminescence
    h) Light-Emitting Diode

7. List the types of light from most to least **efficient**: CFL, incandescent, LED.

8. Label the following **terms** in the **diagram**:

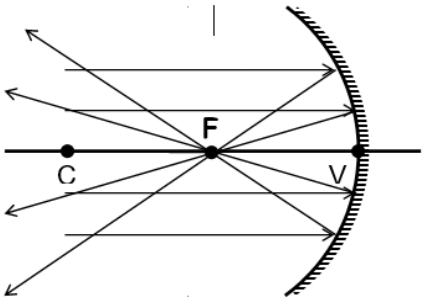
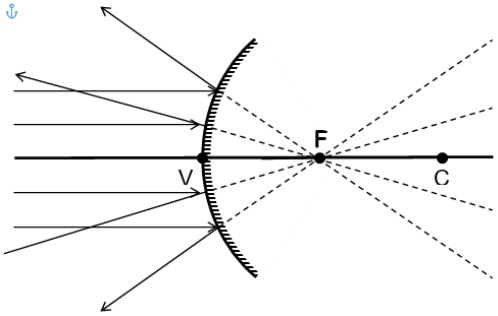
Normal	
Incident ray	
Reflected ray	
Angle of incidence	
Angle of reflection	
Plane mirror	

9. Explain both parts of the **law of reflection** using proper terminology.
10. What is the difference between **specular** and **diffuse reflection**? Give an example for each.
11. What is a **virtual image**? Include an example to help you explain.
12. When describing image characteristics, what does the acronym **SALT** stand for?
13. What are the characteristics (SALT) for an image in a **plane mirror**?
14. Match each **<u>term</u>** to the **<u>definition</u>**.



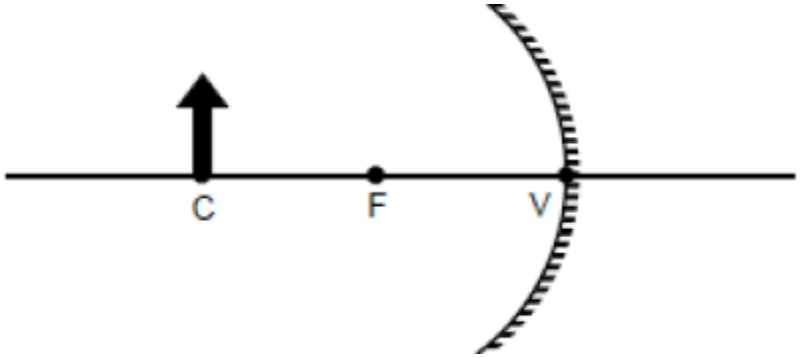
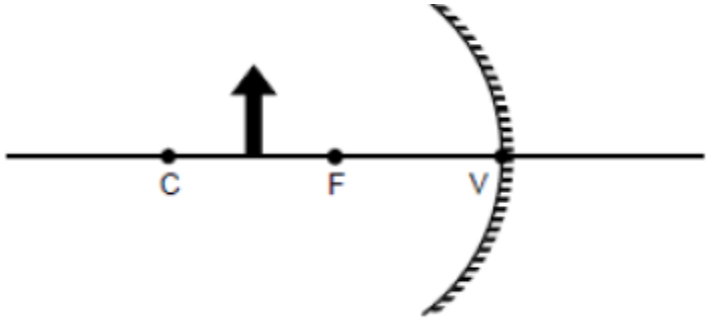
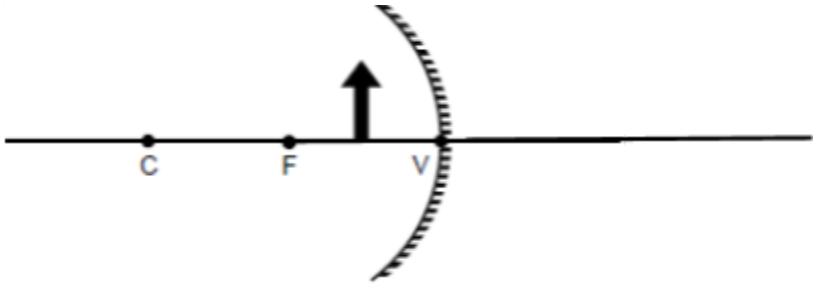
1. ___ Concave	A. The centre of the sphere
2. ___ Convex	B. The line between the centre of curvature and the vertex of a mirror
3. ___ Centre of Curvature	C. The point where parallel light rays come together
4. ___ Principal Axis	D. A mirror whose centre bulges away from you
5. ___ Vertex	E. The point where the principal axis meets the mirror
6. ___ Focus	F. A mirror whose centre bulges towards you

15. Compare the **<u>focus</u>** and the **<u>path of the reflected rays</u>** for **mirrors.**

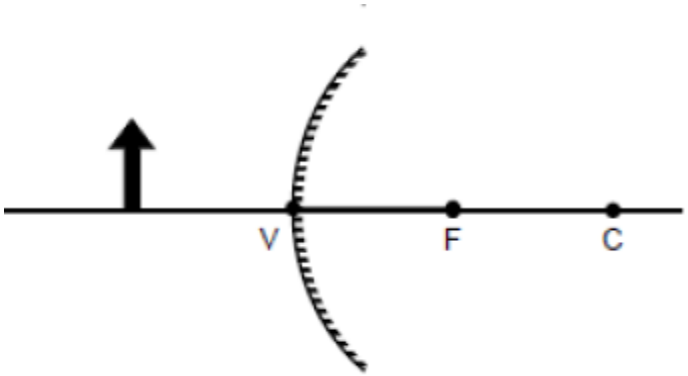
Converging Mirror	**Diverging Mirror**
	
Focus: **Path of Reflected Rays**:	**Focus**: **Path of Reflected Rays**:

16. *For each curved mirror:*

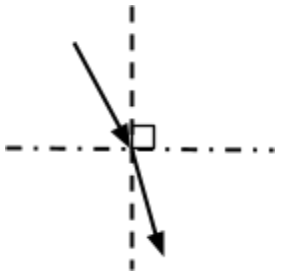
   a. *Draw the **<u>image</u> (white arrow)** (top of image is where reflected rays intersect, bottom is on principal axis)*
   b. *Circle the **<u>SALT characteristics</u>** (Size, Attitude, Location, Type) to describe how the image compares to the original **<u>object</u> (black arrow)**.*

Converging (Concave) Mirrors	
Diagram	**Image Characteristics**
a) Object at C 	**S**: **A**: **L**: **T**:
b) Object between C and F 	**S**: **A**: **L**: **T**:
c) Object between F and V 	**S**: **A**: **L**: **T**:
Diverging (Convex) Mirrors	
Diagram	**Image Characteristics**

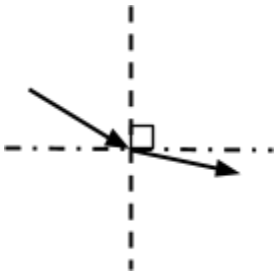
d)	**S**: **A**: **L**: **T**:



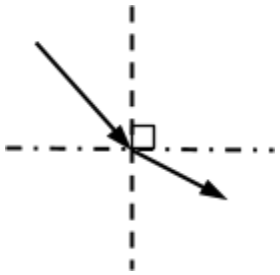
17. **What** is **<u>refraction</u>**? **When** does it occur, and **why**?
18. For each example, write if the light ray is **<u>bending towards</u>** or **<u>away from</u>** the normal, and if it is going from a **<u>fast to a slow</u>** or a **<u>slow to a fast medium</u>**.



a) Bending:
Change in speed:



b) Bending:
Change in speed:



c) Bending:
Change in speed:

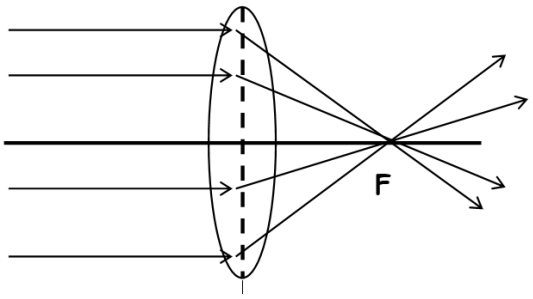
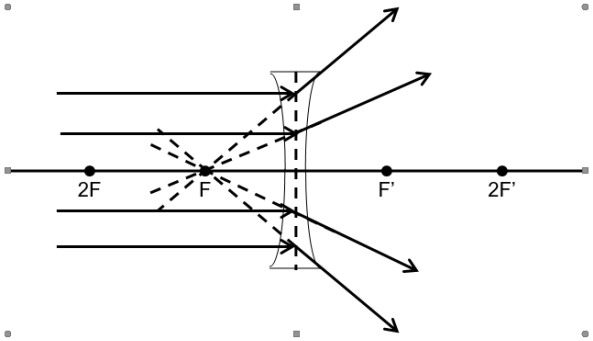
19. Describe an example of **<u>partial reflection & refraction</u>**, and explain what each type of light ray (reflected & refracted) shows.
20. What is an **<u>index of refraction</u>**?
    i) What does it mean that the index of refraction is a **unique property** of a medium?
    ii) As the **<u>index of refraction</u>** **increases**, does the **<u>speed of light</u>** in that medium increase or decrease?
21. The speed of light in sodium chloride is 1.96×10^8m/s. Calculate the **index of refraction** for sodium chloride using GRASS. The speed of light in a vacuum is 3.00×10^8 m/s.
22. Calculate the **speed of light** in a diamond (n= 2.42) using GRASS. The speed of light in a vacuum is 3.00×10^8 m/s.
23. What is **<u>total internal reflection</u>**, and under what **2 conditions** does it occur?

24. Choose **<u>one example or application</u>** of **total internal reflection** and explain them in your own words. Try to include at least **4 "facts"** and **make connections** to some of the concepts you have learned in this unit.

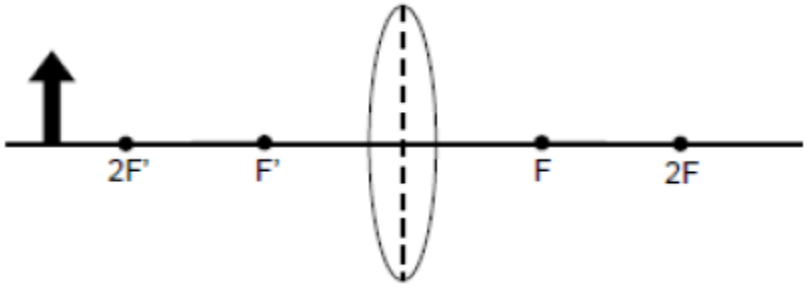
25. Compare the shape of **<u>converging & diverging lenses</u>**.

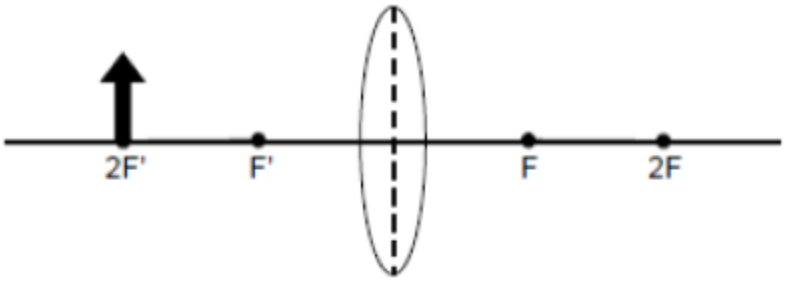
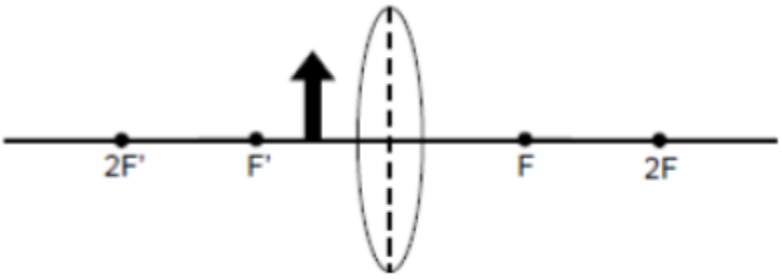
	Converging Lens	**Diverging Lens**
Shape of Lens		

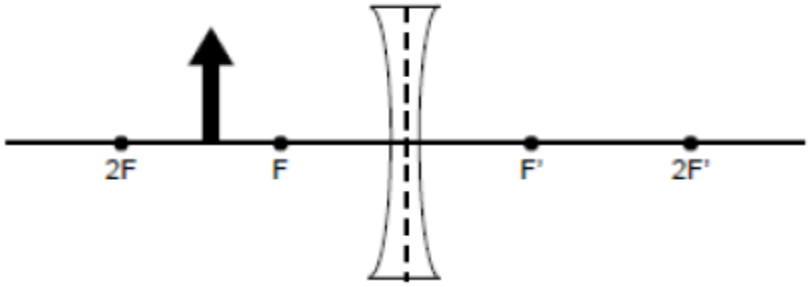
26. Compare the **<u>focus</u>** and the **<u>path of the refracted rays</u>** for **lenses**.

Converging Lens	**Diverging Lens**
	
Focus: **Path of Refracted Rays**:	**Focus**: **Path of Refracted Rays**:

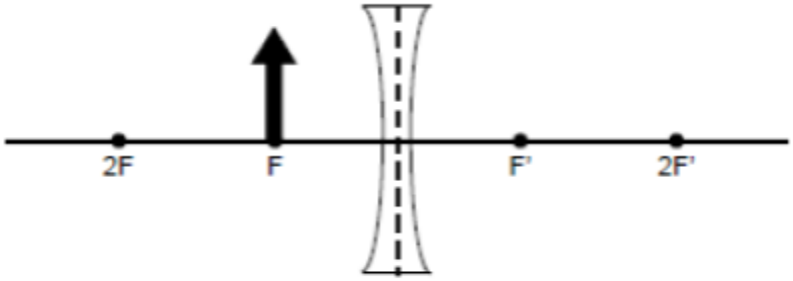
27. *For each lens:*
- *Draw the **<u>image</u> (white arrow)** (top of image is where refracted rays intersect, bottom is on principal axis)*
- *Fill in the **<u>SALT characteristics</u>** (Size, Attitude, Location, Type) to describe how the image compares to the original **object (black arrow).***

Converging Lenses	
Diagram	**Image Characteristics**
a) Object (black arrow) beyond 2F' 	**S**: **A**: **L**: **T**:

b) Object at 2F’  	**S**: **A**: **L**: **T**:
c) Object between F’ and O  	**S**: **A**: **L**: **T**:

Diverging Lenses	
Diagram	**Image Characteristics**
d) Object between 2F and F  	

e) Object at F



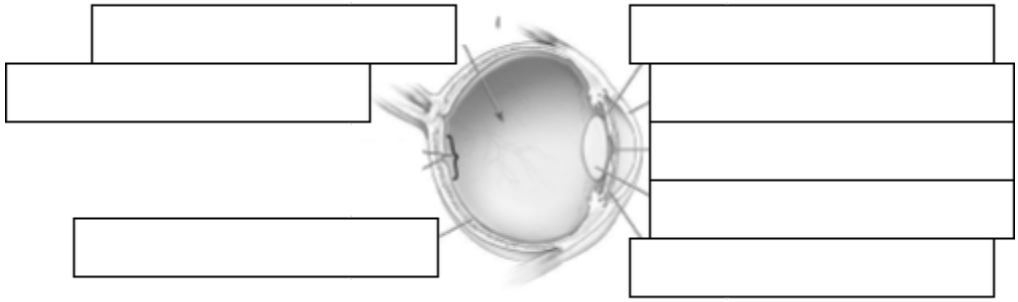
S:

A:

L:

T:

28. Label the parts of the **human eye** on the diagram below.



29. Match each **part of the eye** to the **description**.

1. __ Cornea
2. __ Iris
3. __ Pupil
4. __ Sclera
5. __ Lens
6. __ Aqueous humour
7. __ Vitreous humour
8. __ Ciliary muscles
9. __ Retina
10. __ Optic nerve

1) Layer at the back of the eye that contains light sensitive cells that convert light to electrical signals
2) White outer layer of the eyeball that surrounds the cornea
3) Clear fluid between sclera & lens that provides nutrients for cornea
4) Ring-shaped muscle that opens & closes pupil to let in more or less light
5) Muscles that change the shape of the lens to adjust the focus
6) Clear, protective layer on eye surface that refracts light to pupil
7) Transmits the electrical signal from retina to the brain
8) Hole that allows light to pass to back of eyeball
9) Jelly-like material that maintains the shape of the eyeball and transmits light to retina
10) Flexible tissue that refracts the light towards the retina