



CHEMISTRY OF ART WORKSHEET

Student Name: _____

Acknowledgements:

Prepared by John Simpson, Science Teacher, Baulkham Hills High School in consultation with Education Programs, Public Programs Department, Art Gallery of New South Wales for use with the *Discussion Tour: The Chemistry of Art*, for Stage 6 Chemistry students and teachers.

PART A MEDIEVAL ART WORK

Title: _____

Artist: _____

Medium / materials: _____

Year painted: _____ Age of painting: _____

Country of origin: _____



SYLLABUS LINK: outline the processes used and the chemistry involved to prepare and attach pigments to surfaces in a named example of medieval or earlier artwork.

a. Suggest the names of types of timber used in medieval paintings of this error.

b. Outline the steps involved in preparing the timber for painting.

c. How is the gold leaf adhered to the surface of the painting?

SYLLABUS LINK: identify data, gather and process information from secondary sources to identify and analyse the chemical composition of an identified range of pigments.

d. Give the names, chemical composition and colours of some pigments used in this medieval painting?

Pigment	Colour (other names)	Chemical composition
1.	Blue	
2.	Red	
3.	Yellow	
4.	Green	
5.	Brown	
6.	Black	
7.	White	

SYLLABUS LINK: identify data, gather and process information from secondary sources to identify and analyse the chemical composition of an identified range of pigments.

SYLLABUS LINK: process information from secondary sources to identify the chemical composition of identified cosmetics used in an ancient culture such as early Egyptian or Roman and use available evidence to assess the potential health risk associated with their use.

e. Are any of these pigments toxic and what are their health effects?

Pigment	Health effects

Glossary: Natural Pigments used in Mediaeval Manuscripts

- *Anhydrite and gypsum:* calcium sulphate - white
- *Azurite:* copper carbonate - blue
Azurite was the most important blue pigment in European and Far Eastern paintings, it occurs as a secondary mineral in copper deposits in association with malachite. This pigment is unstable and will turn black on losing moisture; or green as it changes to malachite.
- *Cerussite:* lead carbonate - white lead.
- Lead carbonate this mineral has the ability to cover others giving an intense white colour. This pigment was also produced artificially.
- *Chalk:* calcium carbonate - white
- *Cinnabar:* Mercury sulphide - vermilion red colour.
- *Gold:* used as a foil or leaf, attached to the vellum with resin.
- *Hematite:* Iron oxide - red
Hematite is also known as Indian red, Venetian red, Tuscan red. It has been used in both hydrous and hydrated forms since prehistoric times. This pigment only needed grinding and sieving to prepare the pigment from natural oxides. Sometimes red was produced by heating yellow or brown iron oxides, limonite and bog iron ore.
- *Lapis Lazuli / lazurite:* intense stable blue.
Lazurite is a basic aluminum-magnesium phosphate with iron - Ultramarine blue
- *Malachite:* copper carbonate - Green
- *Minium:* lead oxide – red. This pigment was produced artificially
- *Orpiment:* arsenic trisulphide - bright yellow extremely poisonous.
- *Verdigris:* basic copper acetate - green
This colour was produced from copper deposits in Cyprus, Hungary and France. Copper plates were covered with vinegar, or the stalks and skins of grapes after the juice had been extracted for wine making. The copper acetate was then scraped from the copper plates. The colour produced was sometime adulterated with pumice. Blue and green pigments were also produced by covering copper-silver plates with cloth and applying vinegar and hot horse dung.

**PART B
INDIGENOUS ART**

ARTWORK #1

Title: _____

Artist: _____

Medium / materials: _____

Year painted: _____ **Age of painting:** _____

Country of origin: _____

ARTWORK #2

Title: _____

Artist: _____

Medium / materials: _____

Year painted: _____ **Age of painting:** _____

Country of origin: _____

ARTWORK #3

Title: _____

Artist: _____

Medium / materials: _____

Year painted: _____ **Age of painting:** _____

Country of origin: _____

ARTWORK #4

Title: _____

Artist: _____

Medium / materials: _____

Year painted: _____ **Age of painting:** _____

Country of origin: _____

SYLLABUS LINK: solve problems and perform a first-hand investigation or process information from secondary sources to identify minerals that have been used as pigments and describe their chemical composition with particular reference to pigments available and used in traditional art by Aboriginal people.

a. Complete the table below for pigments used in traditional art by Aboriginal people.

Pigment	Colour (other names)	Chemical composition
1.	Blue	
2.	Red	
3.	Yellow	
4.	Green	
5.	Brown	
6.	Black	
7.	White	

b. What binders were used in traditional Aboriginal art?

c. Describe some traditional techniques used to apply paints.

SYLLABUS LINKS: outline the early uses of pigments for cave drawings self-decoration including cosmetics preparation of the dead for burial.

d. Describe the uses and purposes made of paint in traditional Aboriginal art and culture.

PART C
COMPOSITION AND COMPONENTS OF PAINT

SYLLABUS LINKS: describe paints as consisting of the pigment and a liquid to carry the pigment.

a. What are the components of a paint?

b. Give some examples of different binders?

c. What distinguishes drying oils from other oils and how does this relate to the chemical structure of the oil? Give some examples of drying oils.

d. As a class of pigment how do the 'lakes' differ from other pigments. Give some examples of lakes, their source and colour.

e. Are there disadvantages of lakes as a colour source?

SYLLABUS LINKS: explain why pigments used need to be insoluble in most substances.

f. Unlike dyes, pigments in paint need to be insoluble. Explain.