Thermochromic Dog Collars

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i)Introduction:

A) Thermochromic materials: Thermochromic materials are materials that change colour when a certain temperature has been reached. During these experiments thermochromic ink was painted on a variety of collars and used to demonstrate changes in animal's body temperature. The experiments were carried out between November 2015 and January 2016.

B) Key words: Thermochromic ink, temperature

C) Syllabus: See vii – Relevance to Syllabus - Ireland

D) Length of module: 4 classes

Class 1 – Thermochromic materials

Class 2 – Design and manufacture of collars

Class 3 – Results

Class 4 – Evaluation of results.

ii) Materials:

Dog collar, paint brush , clear polythene, glue, paper (all purchased in DIY store),

thermochromic ink (31°C) (purchased from www.colourchanging.co.uk)

iii) Method:

1) Red Thermochromic ink was mixed with the binder at the recommended rate (see packaging)

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2) Individual strips of paper were then glued to each side of the collar

3) The thermomchromic ink was then painted evenly onto the paper

4) Once dry, the thermochromic ink strips were then covered with clear polythene and secured in place around the collar

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5) The collars were then placed on a number of dogs to record changes in body temperature

iv) Results: Colour to change from red to clear above temperatures of 31°C

Animal	**Colour Change Observed**
German Shepard (dog)	None
Golden Retriever (dog)	None
Maltese (dog)	None

v) Conclusions:

No Colour change was observed for the following reasons:

A) Coat Density:

The dogs that wore the collar were all breeds of dog with dense coats. Thermochromic materials work best when directly in contact with the skin/material which is changing temperature. The heavy coat prevented this from happening.

B) Time of year:

Collars were fitted on the dogs across a 2 month time frame (November 2015 to January 2016). During this time Ireland experienced very mild weather conditions.

vi) Further Research:

Thermochromic collars for animals are cost effective and simple to make. They do have a use in animal body temperature indication. The overall good health of the dogs, combined with the environmental factors resulted in no signs of hypothermia or fever. Other dog breeds with less dense coats could ensure thermochromic collars give accurate indications of ill health in dogs.

vii) Relevance to syllabus – Ireland

1) Leaving Certificate Agricultural Science

Regulation of body temperature; normal temperature; heat production and body temperature in relation to microclimatic control; critical temperature of the pig and ox; consideration of farm buildings in relation to environmental temperature and humidity.

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Farm Buildings – *for school assessment only* Ability to discuss farm buildings and to illustrate how they provide the environmental conditions required on the farm e.g. in regard to cattle and pigs. Emphasis on temperature, ventilation, insulation,

2) Junior Certificate Science

5.3 Physics

Physics is involved in most of the everyday applications of science and technology that we meet in our daily lives, in work, medicine, entertainment and in the home. While physics is principally concerned with the laws and relationships that govern our world, it also provides interesting insights into how things work and contributes to the development of problem-solving skills.

- Section 3A: Force and energy
- Section 3B: Heat, light and sound
- Section 3C: Magnetism, electricity and electronics

Particular relevance to material highlighted in green above

Section 3B2	
Heat transfer	conduction, convection and radiation; heat energy and temperature; insulation

3) Leaving Certificate Physics

Releveance to Thermochromic materials highlighted in green

Ordinary Level	**Higher Level**
Mechanics	Mechanics
Temperature	Temperature
Heat	Heat
Waves	Waves
Vibrations and Sound	Vibrations and Sound
Light	Light
Electricity	Electricity
Modern Physics	Modern Physics
	Option 1: Particle Physics
	Option 2: Applied Electricity

Particular relevance to material highlighted in green above

Ordinary Level	**Higher Level**
Temperature:	**Temperature:**
1) Concept of temperature	1) Concept of temperature
2) Thermometric properties	2) Thermometric properties
3) Thermometers	3) Thermometers
Heat:	**Heat:**
1) Concept of heat	1) Concept of heat

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