Junior Cycle Science - First Year

Investigating ☐ Communicating ☑ Knowledge and understanding ☑

UV Light and Human Health

Learning outcomes in focus

Students should be able to:

NS6 conduct research relevant to a scientific issue, evaluate different sources of information including secondary data, understanding that a source may lack detail or show bias

NS7 organise and communicate their research and investigative findings in a variety of ways fit for purpose and audience, using relevant scientific terminology and representations

ES8 examine some of the current hazards and benefits **of space exploration** and discuss the future role and implications of space exploration in society

BW6 evaluate how human health is affected by: inherited factors and **environmental factors including** nutrition**; lifestyle choices;** examine the role of micro-organisms in human health

Learning intentions

We are learning to:

- conduct independent research
- communicate science to an audience
- evaluate sources
- keep a research log
- identify health implications of exposure to UV light
- identify health implications of exposure to UV light
- identify materials, the use of which, have a negative impact on the ozone layer

Teaching and learning context

This task was undertaken by two mixed-ability classes of First Year students. Prior to the task, students had been conducting an experimental investigation to determine the best design for an astronaut's visor with the proviso that it should afford good visibility and highest protection from UV light. For this they used UV colour changing beads, coloured cellophane gels and UV torches. They had compared the response of the beads to torch light and daylight on overcast and bright days. Following the interest generated by this work students were encouraged to investigate through research. It is common practice for these students to engage with the learning outcomes in the specification.

Task

Students were given four questions and asked to research one or more and to present their findings in a report for the school magazine. The actual task given to the students is included in Appendix 1.

Success Criteria

I can:

SC1: search for and find relevant information about the topic

SC2: arrange and report my findings in my own words in an appropriate format

SC3: use data in an informed manner to argue my position

SC4: evaluate my sources

SC5: organise and acknowledge my sources by keeping a log of my references and refering to these in my report

UV Light and Human Health

You have seen that UV light changes the colour of special beads and that some of these only changed colour when they were taken outside; where the UV light is more intense. In your experiments you discovered the best combination of coloured gels to make a visor for an astronaut. You know that astronauts need extra protection because they travel outside of the Earth's protective atmosphere.

But…

- What are the effects on our health if we get too much or too little UV light?
- How does the atmosphere protect us and have we done anything to reduce this protection?
- Would UV exposure be a concern in the same way as on Earth if we colonised other planets or moons?
- What, if any, lifestyle choices related to UV exposure might affect human health?

You must choose one, or more, of the questions above and research the topic using your Ipad, or other sources. It is important that you keep a written log of all the sources you use. You must consider how reliable the information you find might be and whether important details could have been missed out to help make a point; this is called bias and sometimes occurs in newspaper articles and adverts for example. When you have collected information from a number of different sources you must present your findings as a science report for a school magazine. This must be in your own words. Do not cut and paste other people's work and try to pass it off as your own. The report, excluding the reference list and research notes, must be between 650 and 800 words long. It will be marked against the following success criteria.

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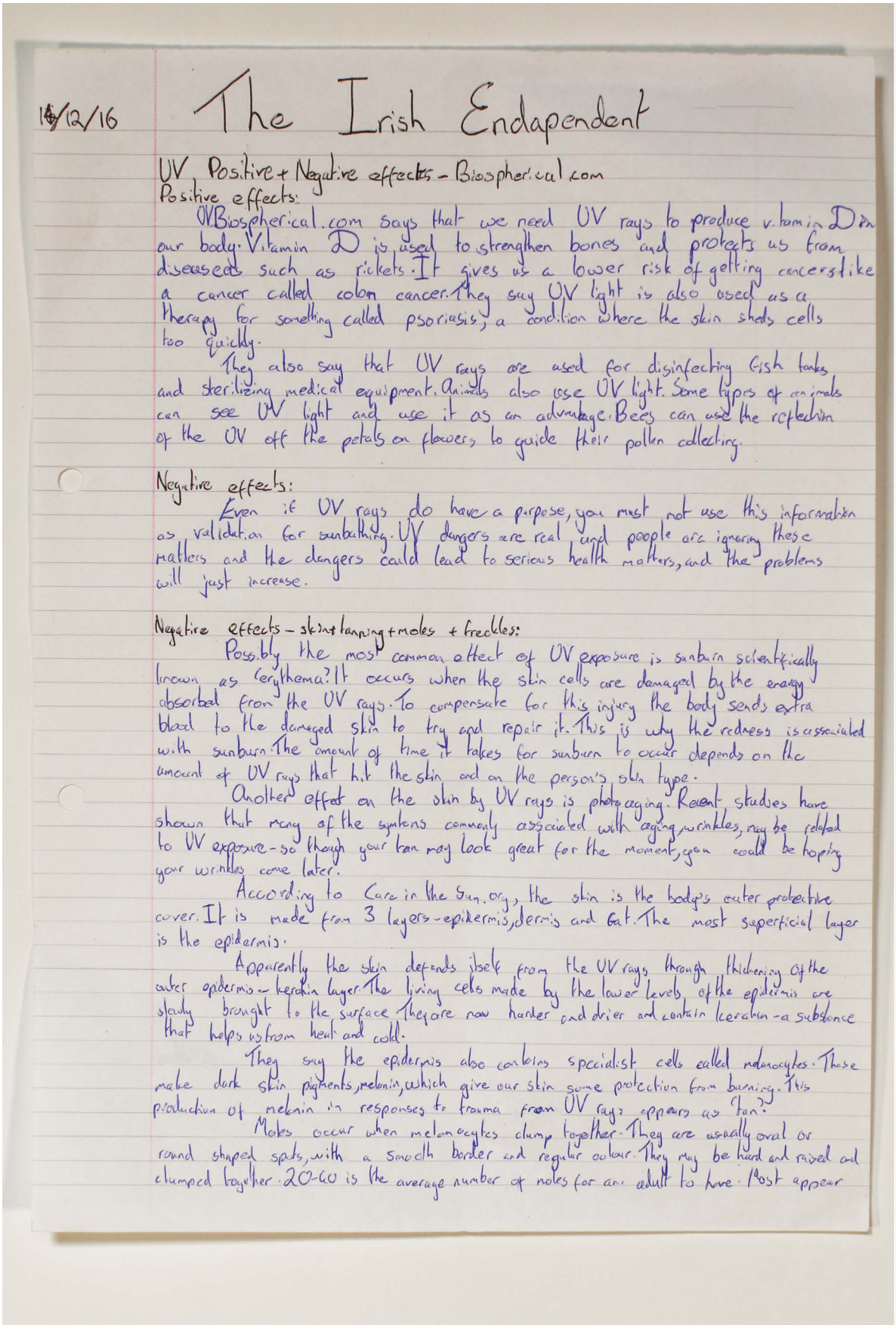


15/12/16 The Irish Endapendant

UV, Positive + Negative effects - Biospherical.com
Positive effects:

UVBiospherical.com says that we need UV rays to produce vitamin D in our body. Vitamin D is used to strengthen bones and protects us from diseases such as rickets. It gives us a lower risk of getting cancers like a cancer called colon cancer. They say UV light is also used as a therapy for something called psoriasis, a condition where the skin sheds cells too quickly.

They also say that UV rays are used for disinfecting fish tanks and sterilizing medical equipment. Animals also use UV light. Some types of animals can see UV light and use it as an advantage. Bees can use the reflection of the UV off the petals on flowers to guide their pollen collecting.

Negative effects:

Even if UV rays do have a purpose, you must not use this information as validation for sunbathing. UV dangers are real and people are ignoring these matters and the dangers could lead to serious health matters, and the problems will just increase.

Negative effects - skin tanning + moles + freckles:

Possibly the most common effect of UV exposure is sunburn scientifically known as erythema? It occurs when the skin cells are damaged by the energy absorbed from the UV rays. To compensate for this injury the body sends extra blood to the damaged skin to try and repair it. This is why the redness is associated with sunburn. The amount of time it takes for sunburn to occur depends on the amount of UV rays that hit the skin and on the person's skin type.

Another effect on the skin by UV rays is photoageing. Recent studies have shown that many of the symtons commonly associated with ageing, wrinkles, may be related to UV exposure - so though your tan may look great for the moment, you could be hoping your wrinkles come later.

According to Care in the Sun.org, the skin is the body's outer protective cover. It is made from 3 layers - epikermis, dermis and fat. The most superficial layer is the epidermis.

Apparently the skin defends itself from the UV rays through thickening of the outer epidermis - keratin layer. The living cells made by the lower levels of the epidermis are slowly brought to the surface. They are now harder and drier and contain keratin - a substance that helps us from heat and cold.

They say the epidermis also contains specialist cells called melanocytes. These make dark skin pigments, melanin, which give our skin some protection from burning. This production of melanin in responses to trauma from UV rays appears as 'tan'.

Moles occur when melanocytes clump together. They are usually oval or round shaped spots, with a smooth border and regular colour. They may be hard and raised and clumped together. 20-40 is the average number of moles for an adult to have. Most appear

during puberty, in later life many may disappear.
Freckles are flat and usually occur on sun exposed areas. Moles and freckles are very common on fair skinned people.

Negative effects - skin cancer:
Another effect is skin cancer. Because of global warming and the ozone layer depletion decreasing it is getting hotter and when people go out with no suncream on it could give you sunburn - or worse - cancer, in minutes. A majority of skin cancers are caused by UV rays according to UVBiospherical.com.

Negative effects - effects on eyes:
UV rays can be reflected back onto the eyes by some substances such as sand and snow. When this occurs the amount of UV rays the eyes are exposed to is increased. This is the condition of snowblindness, scientifically known as photokeratitis. This is a sunburn of the cornea and recedes within one or two days.
According to UV.Biospherical.com, the body has it's own kind of built in defence system against this. If you try to look up at the sun you won't do it for too long because of it's defence system. Elderly people get something called cataract, a condition where it results in blurred, fuzzy vision.

EPA - Environmental Protection Agency
Ozone layer depletion decreases our atmosphere's natural protection from the sun's harmful UV radiation. This leads to more and more problems over time.

Melanoma
According to the EPA melanoma is the most serious form of cancer. It is also now one of the most common ones aswell. It is common for young adults 15-29 years of age. It is the cause of three quarters of skin cancer deaths. It is caused by UV rays.

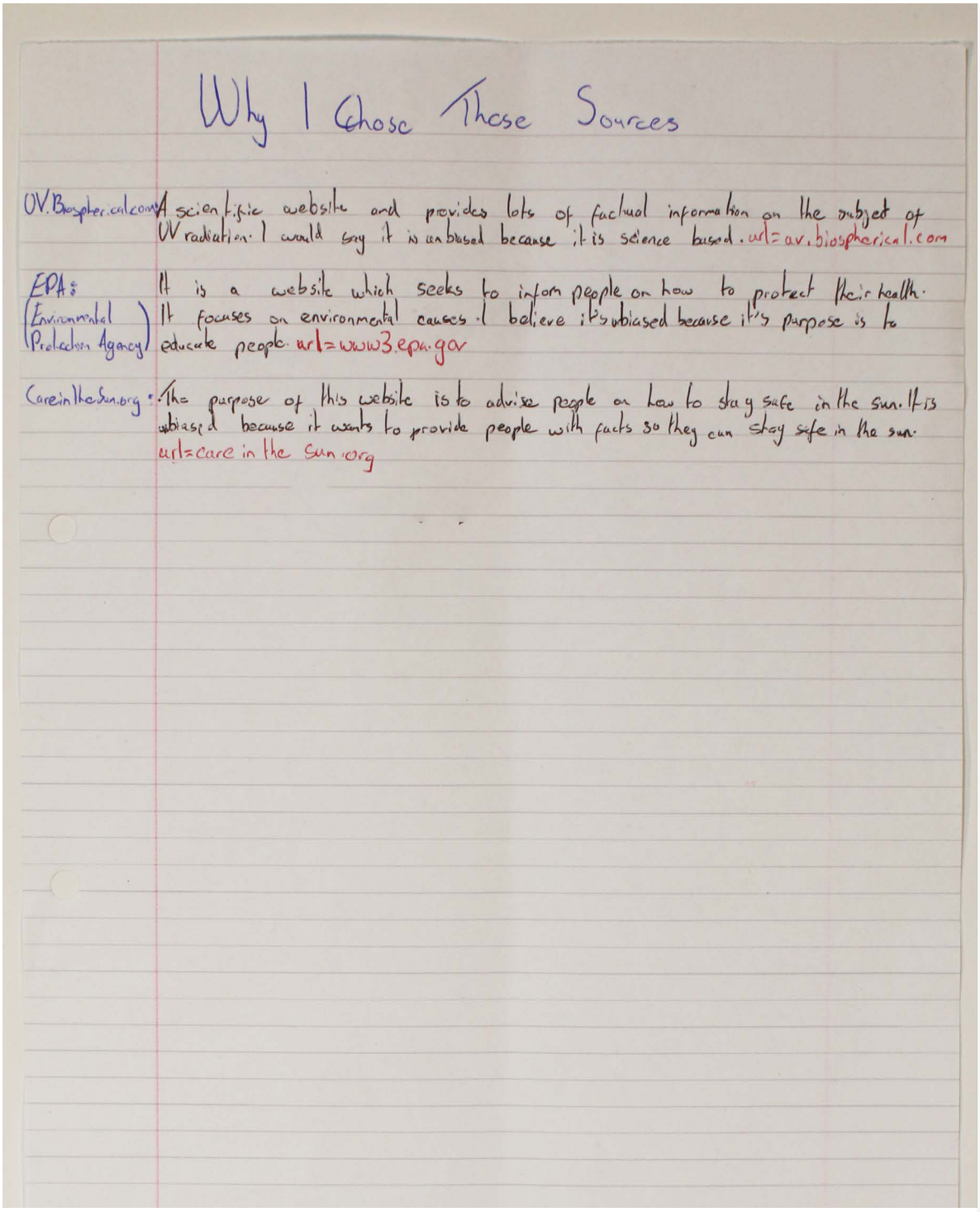
Immune Suppression
The EPA says that scientists have found that overexposure to UV radiation may suppress proper functioning of the body's immune system and the skins natural defences. For example, the skin usually has a defence against foreign invaders like cancers and infections. But overexposure to UV rays weaken the system reducing the skin's ability to protect against these invaders.

The UV Index
UV.Biospherical.com says in order to warn the public of the dangers of UV rays the UV rays, the UV Index was invented and you can find it on the TV or the newspaper. The definition is the same throughout the world. It is simple, 1-3 means low exposure, 4-6 means high exposure and 7-9 means high exposure and 10 or over means extreme exposure.

SC1: Clear evidence that the student has searched for and found relevant information though the number of sites is limited.

SC3: Data is used in an informed manner and pros and cons are detailed, but student's position is unclear.

UV Light and Human Health: Example 2



Why I Chose These Sources

UV.Biospherical.com: A scientific website and provides lots of factual information on the subject of UV radiation. I would say it is unbiased because it is science based. url=uv.biospherical.com

EPA: (Environmental Protection Agency): It is a website which seeks to inform people on how to protect their health. It focuses on environmental causes. I believe it's unbiased because it's purpose is to educate people. url=www3.epa.gov

CareintheSun.org: The purpose of this website is to advise people on how to stay safe in the sun. It is unbiased because it wants to provide people with facts so they can stay safe in the sun. url=care in the sun.org

SC2: The report is well organised.

SC4: Clearly outlines why the sources are reliable with reference to their relevance, accuracy and unbias

SC5: Sources are referenced.

Overall judgement: In Line With Expectations