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91193



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SUPERVISOR'S USE ONLY

Level 2 Earth and Space Science, 2019

91193 Demonstrate understanding of physical principles related to the Earth System

9.30 a.m. Wednesday 27 November 2019
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of physical principles related to the Earth System.	Demonstrate in-depth understanding of physical principles related to the Earth System.	Demonstrate comprehensive understanding of physical principles related to the Earth System.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Achievement

TOTAL

09

ASSESSOR'S USE ONLY

QUESTION ONE: THE COLOUR OF CLOUDS



www.thoughtco.com/types-of-clouds-recognize-in-the-sky-4025569

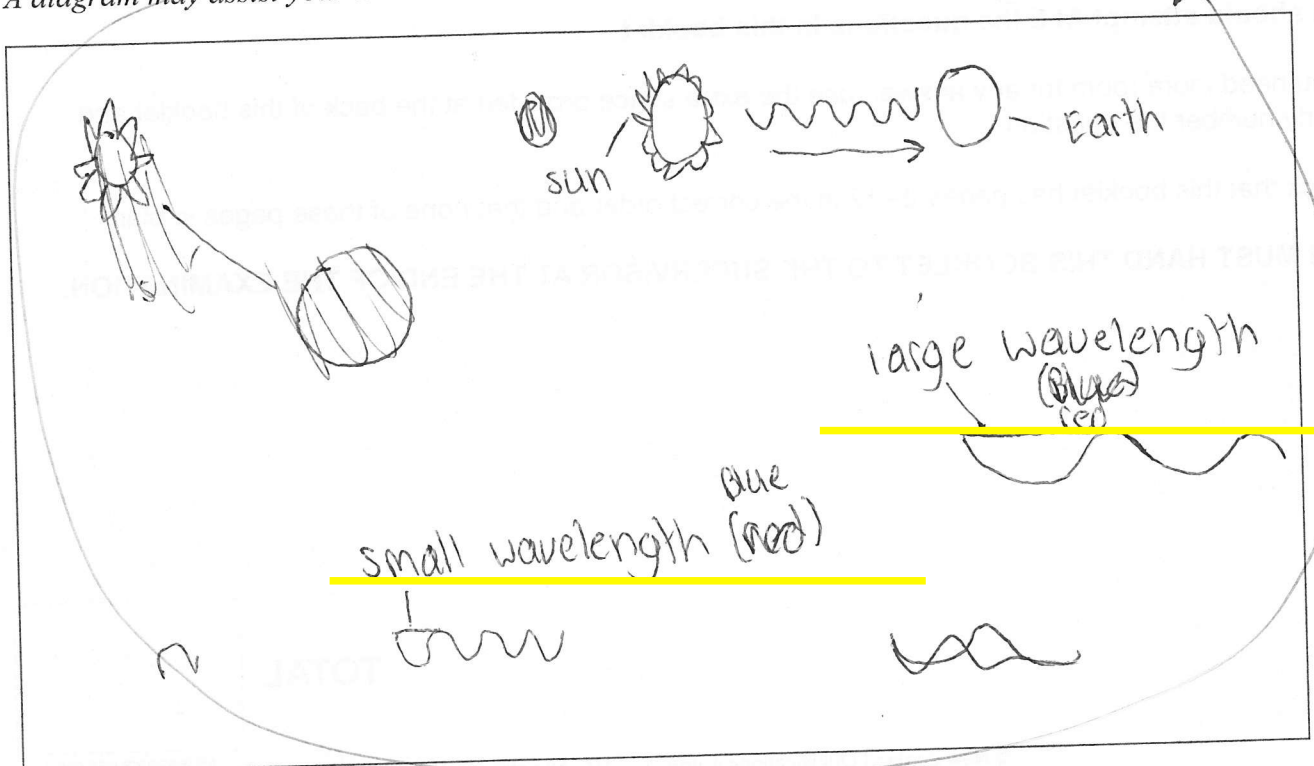
Clouds reduce the amount of sunlight reaching the surface of the Earth, but they do allow some light through.

Explain, in detail, why clouds often appear white.

In your answer, you should consider:

- how light travels through space to reach the Earth
- how colours of the light spectrum differ from each other
- what happens to the light as it travels through the clouds
- why the bases of clouds often look darker.

A diagram may assist your answer.



The sun emits

The sun emits light in all different colours and therefore different wavelengths. The wave lengths travel towards earth as shown the diagram the wiggle up and down but are traveling the way the arrow is pointing. There are multiple colours in the spectrum ranging from red which has a ~~small~~ large wavelength which has a less energy and when it is travelling can be affected by dust particles which can make the sky look red like during sun rise. At the other end of the spectrum is blue which has a smaller wavelength with more energy meaning it can travel further without being disrupted which is why the atmosphere sky appears blue. ~~Some~~ Light that travels through the clouds is absorbed which is why the bottom of clouds look darker.

More space for this
answer is available on
the following page.

QUESTION TWO: CLOUD EFFECTS ON EARTH'S RADIATION

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Cloud Effects on Earth's Radiation



Stratosphere
exosphere
mesosphere

https://eoimages.gsfc.nasa.gov/images/imagerecords/54000/54219/Clouds_effects.jpg

A NASA satellite is used to measure radiant energy from both the Sun and the Earth at the top of the atmosphere. This has helped scientists to understand the effects clouds have on the temperature of the Earth.

Use the diagram to help you explain in detail the different effects clouds may have on the movement of energy to and from the Earth.

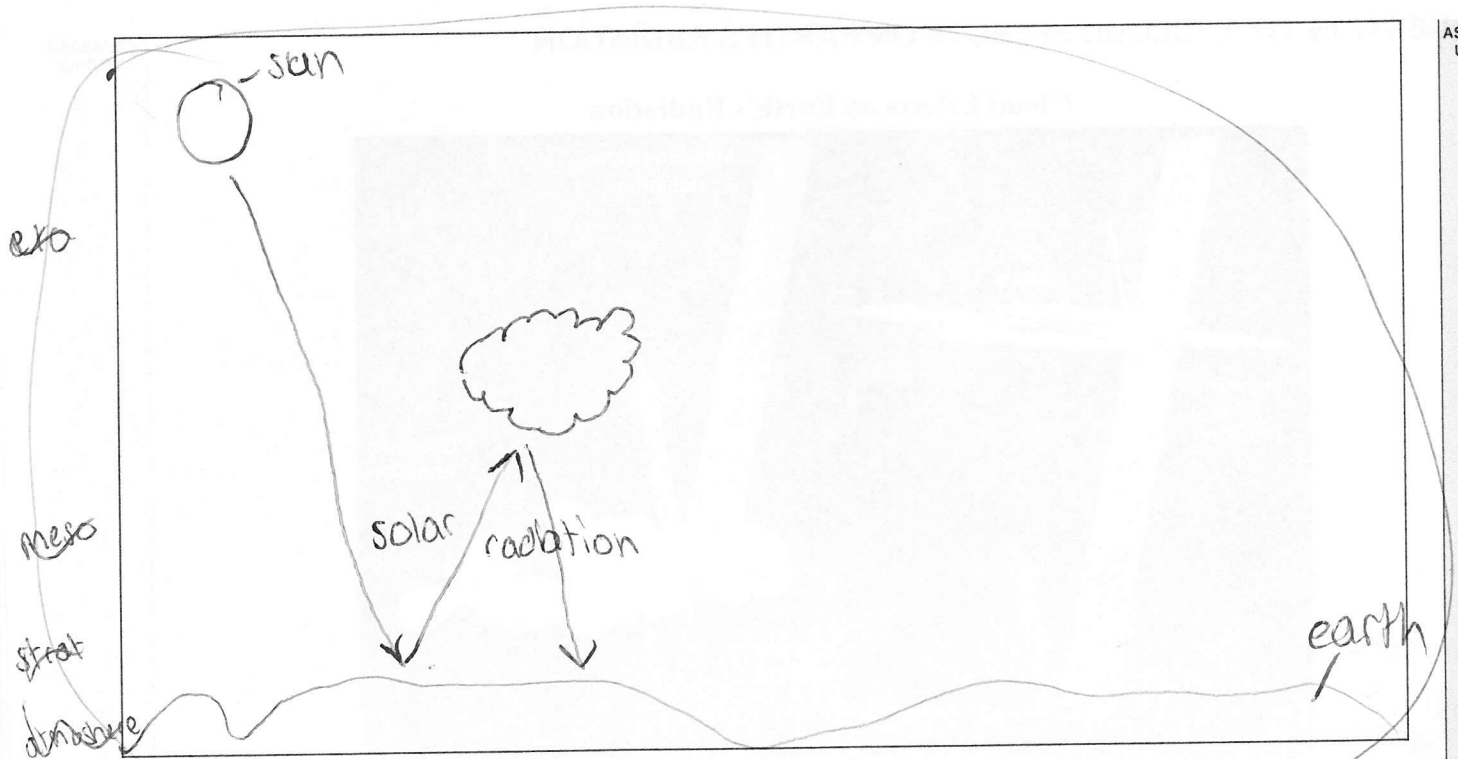
In your answer, you should consider:

- where clouds may form and the effect the different locations may have on energy transfer to and from the Earth
- the difference between the energy from the Sun and the Earth
- whether the clouds may have a warming or cooling effect on the Earth at different times of day.

A diagram may assist your answer; there is space for this on the following page.

clouds form in the stratosphere. Clouds reflect solar radiation so if solar radiation hits a cloud depending on the location of the cloud a lot or some of the radiation will be reflected. For example if we are talking about clouds high in the stratosphere where clouds are thinner & not very much solar radiation will be reflected but if it lower in the stratosphere where the

More space for this answer is available on the following pages.



clouds are thicker the majority of the solar radiation will be reflected. Clouds can also reflect solar radiation back to earth as shown in my diagram. This keeps the earth warmer. The origin of the energy from the sun and earth is the same because of how it forms during nuclear fission but the way each reach the surface of earth is different with the sun's coming by radiation and the earth's travels through the core by conduction which is and through the mantle by convection it then reaches the surface by springs and volcanic eruption but it also emits from the surface to. During the day clouds can have a both cooling or heating affect whether they are reflecting the the solar radiation or keeping it in once it hits the earth's surface. during the night clouds have no effect.

[www.interscience.wiley.com/jpages/0950-0804/201003235-fs11](https://doi.org/10.1002/for.201003235-fs11)

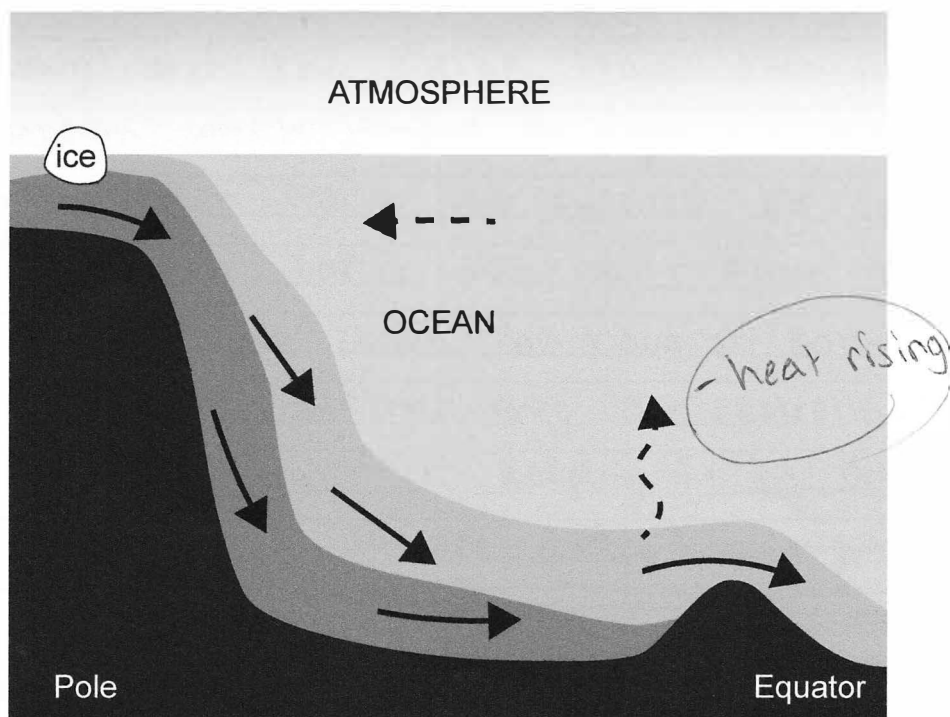
www.jpl.nasa.gov/images/earth/20100325/atlantic20100325-full.jpg

The global ocean conveyor belt is a series of ocean currents that transfer heat around the globe, driven by cold, dense water sinking at the poles. It has a major effect on the Earth's climate, accounting for a quarter of the Earth's heat transport.

Explain in detail the energy transfer processes involved in the global ocean conveyor belt.

In your answer, you should:

- label the diagram below, showing heat transfers taking place at different latitudes
- explain the reason for the temperature difference between the poles and the Equator
- explain, in detail, the energy transfers taking place
- explain the role of these heat transfer processes in the Earth's climate.



It is a lot hotter at the equator because the sun is much more concentrated there and is covering a lot less space where as at the equator poles the suns rays are ~~at~~ a lot more spread out and ~~are~~ not heating the area as much as it does at the equator.

More space for this answer is available on the following page.

Achievement Exemplar 2019

Subject	L2 Earth and Space Science	Standard	91193	Total score	11
Q	Grade score	Annotation			
1	A4	The candidate provides evidence of light travelling as electromagnetic waves. The link between the different wavelengths of visible light and colour is stated. A diagram provides supplementary evidence.			
2	A3	The candidate has related the ability of high and low clouds to transmit or reflect solar radiation. This relationship is linked to the ability of clouds to keep the Earth warmer.			
3	A3	The candidate relates the concentration of solar radiation to its effect of heating at the Earth's equator and the Poles.			

Confirmation of check	Y / N
This exemplar has been checked for similarities with current online exemplars.	Y