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Learners' conceptions about astronomical concepts related to the sun and the earth

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APPENDIX 1

TOPIC: The Earth-Sun Relationship

Purpose of the Exercise

Please note that the findings from this exercise will be useful in the improvement of science learning, *i.e.* this exercise is not a test.

Note that some learners may be asked to give more explanations of their responses after this exercise. You are therefore asked to provide your personal information in the spaces provided. The findings from this exercise will be confidential.

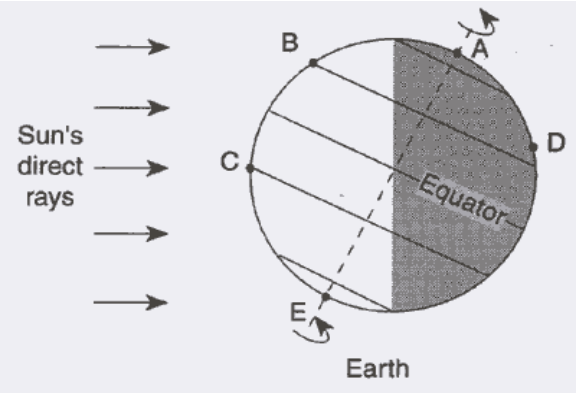
Home language ……

Gender: (tick the appropriate) | Male | | Female |

Instructions

1. Answer all the questions.
2. Use diagrams to explain your answers.
3. On the last page state the problems you encountered while completing this exercise. You may refer to specific questions for this purpose.

1. In the diagram below, points *A* to *E* are locations on Earth's surface. The dashed line represents the Earth's axis.



a) Use information on the diagram to decide the date that is illustrated.
Month _____ Day _____

Explain your answer.

b) Which of the following diagrams best represents the angle of the Sun's rays received at location *C* at noon on this day?

1



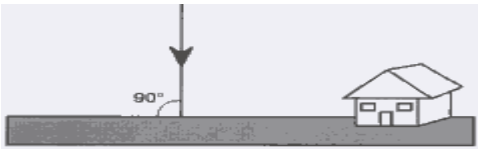
2



3



4



Explain your answer for question 1(b).

2. Draw a diagram to describe the Earth-Sun relationship when day time is equal to night time in Polokwane (Limpopo province). Polokwane has a latitude of $23{,}5^{o}S$.

3. Explain why summer is hotter than winter in Benoni.

4. As seen from Benoni, at what time of the year is the sun directly overhead at noon?

5. For centuries people have looked up and wondered why the sun travels across the sky each day, disappearing only to appear again the next day. Give an explanation for this (apparent) movement of the sun.

6. What happens to the moon during the day?

7. The years 2001, 2002 and 2003 had a total of 365 days each (with 28 days in February) but 2004 has 366 days (29 days in February). Explain why there are 366 days once in every four years.

8. Explain why it is summer in the Southern hemisphere when it is winter in the Northern hemisphere.

9. Describe how the rising and setting points of the Sun change from the June solstice to the December solstice.

10. Suppose the axis of the Earth **were not tilted**.

a) What would seasons be like on Earth?

b) If the axis of the earth were not tilted, what would be the hottest part of the Earth?

In the space below mention any problems you had when completing this questionnaire. You may refer to specific questions.

APPENDIX 2

TOPIC: The Earth-Sun Relationship

Purpose of the Exercise

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Home language ……

Gender: (tick the appropriate) | Male | | Female |

Instructions

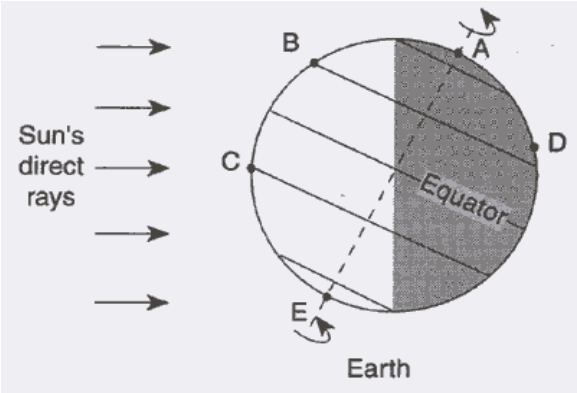
1. Answer all the questions.
2. Use diagrams to explain your answers.

1. For centuries people have looked up and wondered why the sun travels across the sky each day, disappearing only to appear again the next day. Explain why the sun seems to move in the sky each day.

2. Explain why summer is hotter than winter

3. Draw a diagram to describe the sun's rays on earth when day time is equal to night time in Polokwane (Limpopo province). Polokwane is along the tropic of Capricorn; 23½^{o} S.

4. The diagram below shows sun's rays received by the earth in one particular day. The points A, B, C, D, and E are locations on the Earth's surface, and the dashed line AE represents the Earth's axis.



(a) Looking at locations A to E and the sun's rays decide the date shown in the diagram above.

Month……..Day…….

Explain your answer

(b) Which of the following diagrams best represents the angle of the Sun's rays received at location *C* at noon on this day?

1



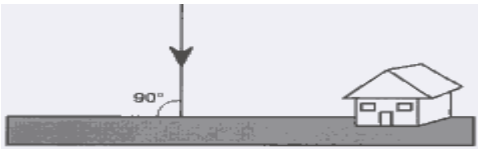
2



3



4



Explain your answer for question 4(b).

5. The year 2004 is a leap year (with 366 days) while the years 2001, 2002, and 2003 had 365 days. Explain why a leap year comes once in every four years.

6. As seen from Benoni in what **time of the year** does the sun seem to be directly above our heads at noon, so that no shadows are formed?

   Explain your answer.

7. Explain why the southern hemisphere has summer when the northern hemisphere has winter.

8. Explain why the position of sunrise seems to move towards the north in winter and towards the south in summer.

9. What happens to the moon during the day?