

ANSWERS

SEMMELEWEIS' DIARY SCORING 1.1

Full credit: Responses that refer to the difference between the numbers of deaths (per 100 deliveries) in both wards, such as:

- Due to the fact that the first ward had a high rate of women dying compared to women in the second ward, obviously shows that it had nothing to do with earthquakes.
- Not as many people died in ward 2 so an earthquake couldn't have occurred without causing the same number of deaths in each ward.
- Because the second ward isn't as high, maybe it had something to do with ward 1.
- It is unlikely that earthquakes cause the fever since death rates are so different for the two wards.

Partial credit:

- Responses that refer to the fact that earthquakes don't occur frequently, for example:
- It would be unlikely to be caused by earthquakes because earthquakes wouldn't happen all the time.
- Responses that refer to the fact that earthquakes also influence people outside the wards, for example:
- If there were an earthquake, women from outside the hospital would have got puerperal fever as well.
- If an earthquake were the reason, the whole world would get puerperal fever each time an earthquake occurs (not only the wards 1 and 2).
- Responses that refer to the thought that when earthquakes occur, men don't get puerperal fever for example:
- If a man were in the hospital and an earthquake came, he didn't get puerperal fever, so earthquakes cannot be the cause.
- Because girls get it and not men.

No credit:

- Responses that state (only) that earthquakes cannot cause the fever, for example:
- An earthquake cannot influence a person or make him sick.
- A little shaking cannot be dangerous.
- Responses that state (only) that the fever must have another cause (right or wrong), for example:
- Earthquakes do not let out poison gases. They are caused by the plates of the Earth folding and faulting into each other.
- Because they have nothing to do with each other and it is just superstition.
- An earthquake doesn't have any influence on the pregnancy. The reason was that the doctors were not specialised enough.

- Other responses and missing.

Answering this question correctly corresponds to a difficulty of 666 score points on the PISA 2000 science scale. 22% of students across OECD countries answered it correctly and 28% of students across OECD countries gave a partially correct answer. The question was part of the PISA 2000 scientific process drawing or evaluating conclusions.

SEMMELEWEIS' DIARY SCORING 1.2

Full credit: A. Having students clean themselves after dissections should lead to a decrease of puerperal fever.

No credit: Other responses and missing.

The difficulty of this question corresponds to 493 score points on the PISA 2000 science scale. On average across OECD countries, 64% of students gave the correct answer. This question falls into the PISA 2000 scientific process recognising questions.

4

SEMMELEWEIS' DIARY SCORING 1.3

Full credit:

- Responses that refer to *killing of bacteria* .
 - Because with the heat many bacteria will die.
 - Bacteria will not stand the high temperature.
 - Bacteria will be burnt by the high temperature.
 - Bacteria will be cooked.
- Responses that refer to *killing of microorganisms, germs or viruses*.
 - Because high heat kills small organisms which cause disease.
 - It's too hot for germs to live.
- Responses that refer to the *removal* (not killing) of bacteria.
 - The bacteria will be gone.
 - The number of bacteria will decrease.
 - You wash the bacteria away at high temperatures.
 - Because you won't have the germ on your body.
- Responses that refer to the *removal* (not killing) of microorganisms, germs or viruses or to the sterilisation of the sheets.

No credit:

- Responses that refer to killing of disease.
 - Because the hot water temperature kills any disease on the sheets.
 - The high temperature kills most of the fever on the sheets, leaving less chance of contamination.
- Other responses and missing.

The difficulty of this question corresponds to 467 score points on the PISA 2000 science scale. 68% of students across OECD countries gave the correct answer. The question falls into the scientific process demonstrating knowledge and understanding.

SEMMELEWEIS' DIARY SCORING 1.4

Full credit: B. Bacteria become resistant to antibiotics.

No credit: Other responses and missing.

The difficulty of this question corresponds to 508 score points on the PISA 2000 science scale. 60% of students across OECD countries gave the correct answer. The question is part of the process category demonstrating knowledge and understanding.

4

OZONE SCORING 2.1

Full credit: Answers which mention the following three aspects:

First aspect: an oxygen molecule or some oxygen molecules (each consisting of two oxygen atoms) are split into oxygen atoms (picture 1).

- The splitting should be described using the correct words (see lines 5 and 6) for O (atom or atoms) and O₂ (molecule or molecules).
- If O and/or O₂ have been described only as “particles” or “small parts” no credit should be given for this aspect.

Second aspect: the splitting (of oxygen molecules) takes place under the influence of sunlight (picture 1).

- The sun's influence should be related to the splitting of O₂ (an oxygen molecule or oxygen molecules).
- If the sun's influence is related to the forming of an ozone molecule from an oxygen atom and an oxygen molecule (pictures 2 and 3) no credit should be given for this second aspect.

Note: Aspects 1 and 2 may typically be given in the one sentence.

Third aspect: the oxygen atoms combine with other oxygen molecules to form ozone molecules (pictures 2 and 3).

- Credit (one point) should be given for this aspect if the answer contains any description of an O combining with an O₂. If the formation of O₃ is described as the combining of (three, separate) O atoms, credit should not be given for this third aspect.
- If O₃ is not described as a molecule or molecules but for example as “a group of atoms” this can be tolerated for the third aspect.

Examples of such answers:

- When the sun shines on the O₂ molecule the two atoms separate. The two O atoms look for other O₂ molecules to join with. When the O₁ and O₂ join they form O₃, which is ozone.

- The strip illustrates the formation of ozone. If an oxygen molecule is affected by the sun, it breaks into two separate atoms. These separate atoms, O, float around looking for a molecule to link up to; they link up to existing O₂ molecules and form an O₃ molecule, as three atoms are now joined together; O₃ forms ozone.
- The little guys are O, or oxygen atoms. When two are joined they make O₂ or oxygen molecules. The sun causes these to decompose into oxygen again. The O₂ atoms then bond with O₂ molecules creating O₃, which is ozone. *[Note: this answer can be regarded as correct. There is only one slip of the pen (“O₂ atoms” after having mentioned “oxygen atoms” previously).]*

Partial credit:

- Answers which correctly mention only the first and second aspects. For example:

- The sun decomposes the oxygen molecules into single atoms. The atoms fuse into groups. The atoms form groups of 3 atoms together.

- Answers which correctly mention only the first and third aspects. For example:

- Each of the little fellows stand for one atom of oxygen. O is one oxygen atom, O₂ is an oxygen molecule and O₃ is a group of atoms all joined together. The processes shown are one pair of oxygen atoms (O₂) getting split and then each joining with 2 other pairs forming two groups of 3 (O₃).
- The little fellows are oxygen atoms. O₂ means one oxygen molecule (like a pair of little fellows holding hands) and O₃ means three oxygen atoms. The two oxygen atoms of one pair break apart and one joins each of the other pairs and out of the three pairs, two sets of three oxygen molecules (O₃) are formed.

- Answers which correctly mention only the second and third aspects. For example:

- The oxygen is broken up by the sun’s radiation. It splits in half. The two sides go and join other oxygen “particles” forming ozone.
- Most of the time in pure oxygen (O₂) environments oxygen comes in pairs of 2 so there are 3 pairs of 2. 1 pair is getting too hot and they fly apart going into another pair making O₃ instead of O₂. *[Note: Although “one pair is getting too hot” is not a very good description for the sun’s influence, credit should be given for the second aspect; the third aspect can also be regarded as correct.]*

- Answers which correctly mention the first aspect only. For example:

- Oxygen molecules are breaking down. They form O atoms. And sometimes there are ozone molecules. The ozone layer remains the same because new molecules are formed and others die.

- Answers which correctly mention only the second aspect. For example:

- O represents an oxygen molecule, O₂ = oxygen, O₃ = ozone. Sometimes both oxygen molecules, joining each other, are separated by the sun. The single molecules join another pair and form ozone (O₃).

- Answers which correctly mention only the third aspect. For example:

- The 'O' (oxygen) molecules are forced to bond with O₂ (2 x oxygen molecules) to form O₃ (3 x oxygen molecules), by the heat of the sun. [Note: the underlined part of the answer shows the third aspect. No credit can be given for the second aspect, because the sun is not involved in the formation of ozone from O + O₂ but only in breaking down bonds in O₂.]

No credit: Answers which do not correctly mention any of the three aspects. For example:

- The sun (ultraviolet rays) burns the ozone layer and at the same time is destroying it as well. Those little men are the ozone layers and they run away from the sun because it is so hot. [Note: no point can be awarded, not even for mentioning something about the sun's influence.]
- The sun is burning the ozone in the first box. In the second box they are running away with tears in their eyes and in the third box they are cuddling each other with tears in their eyes.
- Well uncle Herb it's simple. 'O' is one oxygen particle, the numbers next to 'O' increase the amounts of particles in the group.

Answering this question correctly corresponds to a difficulty of 682 score points on the PISA 2000 science scale. Giving a partially correct answer corresponds to a difficulty of 628 score points on the PISA 2000 science scale. Across OECD countries, 28% of students answered correctly. The question assesses student's ability to communicate valid conclusions from evidence/data.

OZONE SCORING 2.2

Full credit: B. Bad. It is formed in the troposphere.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 642 score points on the PISA 2000 science scale. Across OECD countries, 35% of students answered correctly. To answer this question, students need to critically evaluate scientific evidence/data.

OZONE SCORING 2.3

Full credit: Answers which refer to skin cancer. For example:

- Skin cancer.
- Melonoma. [Note: this answer can be regarded as correct, despite the fact that it has a spelling mistake.]

No credit: Answers which refer to other specific types of cancer, answers which only refer to cancer in general and missing.

Answering this question correctly corresponds to a difficulty of 547 score points on the PISA 2000 science scale. Across OECD countries, 54% of students answered correctly. To answer this question, students have to apply scientific knowledge to the presented situation.

DAYLIGHT SCORING 3.1

Full credit: A. The Earth rotates on its axis.

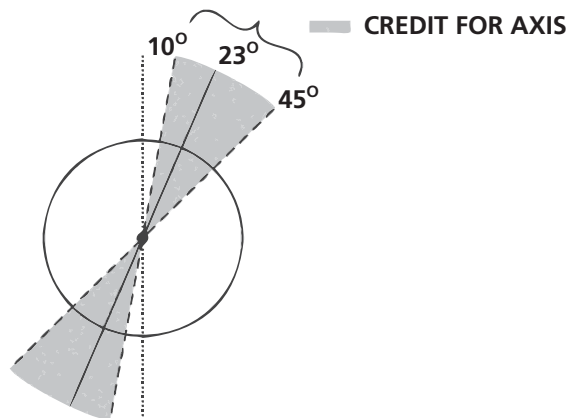
No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 592 score points on the PISA 2003 science scale. Across OECD countries, 43% of students answered correctly. This question assesses the process describing, explaining and predicting scientific phenomena.

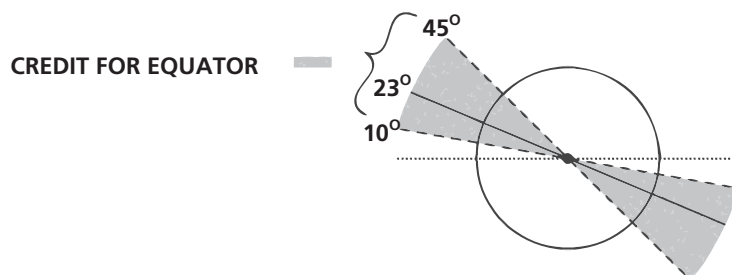
DAYLIGHT SCORING 3.2

The important features when marking this question are:

- The Earth's axis is drawn tilted towards the Sun within the range 10° and 45° from vertical for credit: Outside of 10° and 45° to vertical range: no credit.
- The presence or absence of clearly labelled Northern and Southern Hemispheres, or one Hemisphere only labelled, the other implied.



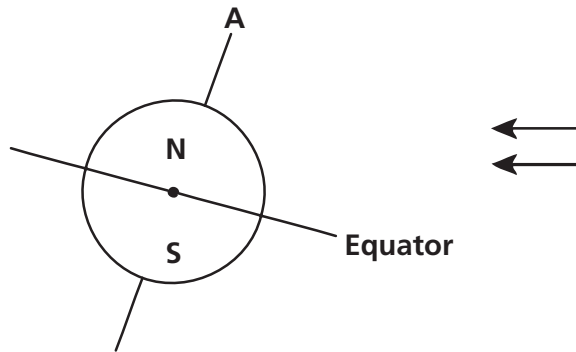
- The equator is drawn at a tilt towards the Sun within the range 10° and 45° above horizontal for credit: refer to the following diagram: The equator may be drawn as an elliptical line or straight line.



- Outside of 10° and 45° to horizontal range: no credit.

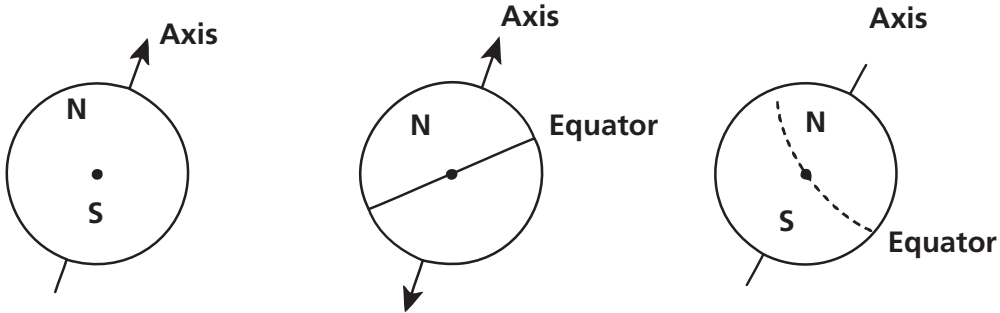
Full credit:

Diagram with Equator tilted towards the Sun at an angle between 10° and 45° and Earth's axis tilted towards the Sun within the range 10° and 45° from vertical, and the Northern and or Southern Hemispheres correctly labelled (or one only labelled, the other implied).

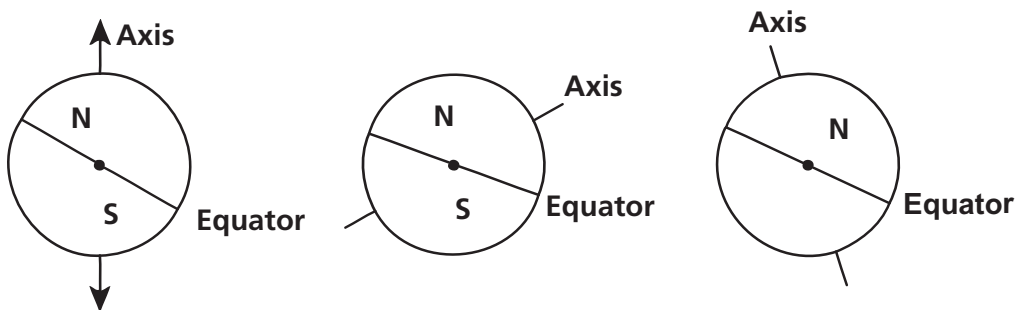


Partial credit:

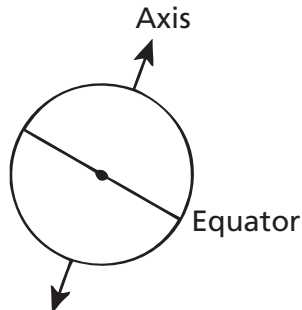
Angle of tilt of axis between 10° and 45° , Northern and / or Southern Hemispheres correctly labelled (or one only labelled, the other implied), but angle of tilt of Equator not between 10° and 45° ; or Equator missing.



Angle of tilt of Equator between 10° and 45° , Northern and / or Southern Hemispheres correctly labelled (or one only labelled, the other implied), but angle of tilt of axis not between 10° and 45° ; or axis missing.

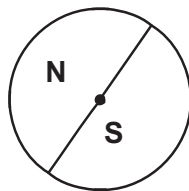


Angle of tilt of Equator between 10° and 45° , and angle of tilt of axis between 10° and 45° , but Northern and Southern Hemispheres not correctly labelled (or one only labelled, the other implied, or both missing).

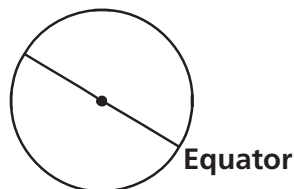


No credit:

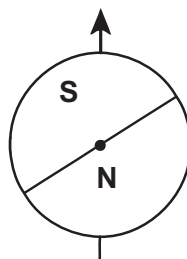
- Northern and or Southern Hemispheres correctly labelled (or one only, the other implied) is the only correct feature.



- Angle of tilt of Equator between 10° and 45° is the only correct feature.



- Angle of tilt of axis between 10° and 45° is the only correct feature.



- No features are correct, other responses and missing.

Answering this question correctly corresponds to a difficulty of 720 score points on the PISA 2003 science scale. Giving a partially correct answer corresponds to a difficulty of 667 score points on the PISA 2003 science scale. Across OECD countries, 19% of students answered correctly. This question assesses the process describing, explaining and predicting scientific phenomena.

CLONING SCORING 4.1

Full credit: A. Sheep 1.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 494 score points on the PISA 2003 science scale. Across OECD countries, 65% of students answered correctly. This question assesses the process describing, explaining and predicting scientific phenomena.

CLONING SCORING 4.2

Full credit: A. a cell.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 572 score points on the PISA 2003 science scale. Across OECD countries, 47% of students answered correctly. This question assesses the process describing, explaining and predicting scientific phenomena.

CLONING SCORING 4.3

Full credit: Yes, No, in that order.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 507 score points on the PISA 2003 science scale. Across OECD countries, 62% of students answered correctly. This question assesses the process understanding scientific investigation.

GREENHOUSE SCORING 5.1

Full credit:

- Responses that refer to the increase of both (average) temperature and carbon dioxide emission.
 - As the emissions increased the temperature increased.
 - Both graphs are increasing.
 - Because in 1910 both the graphs began to increase.
 - Temperature is rising as CO₂ is emitted.
 - The information lines on the graphs rise together.
 - Everything is increasing.
 - The more CO₂ emission, the higher the temperature.
- Responses that refer (in general terms) to a positive relationship between temperature and carbon dioxide emission.
 - The amount of CO₂ and average temperature of the Earth is directly proportional.
 - They have a similar shape indicating a relationship.

No credit:

- Responses that refer to the increase of either the (average) temperature or the carbon dioxide emission.
 - The temperature has gone up.
 - CO₂ is increasing.
 - It shows the dramatic change in the temperatures.
- Responses that refer to temperature and carbon dioxide emission without being clear about the nature of the relationship.
 - The carbon dioxide emission (graph 1) has an effect on the earth's rising temperature (graph 2).
 - The carbon dioxide is the main cause of the increase in the earth's temperature.
- Other responses.
 - The carbon dioxide emission is greatly rising more than the average Earth's temperature. *[Note: This answer is incorrect because the extent to which the CO₂ emission and the temperature are rising is seen as the answer, rather than that they are both increasing.]*
 - The rise of CO₂ over the years is due to the rise of the temperature of the Earth's atmosphere.
 - The way the graph goes up.
 - There is a rise.
- Missing.

Answering this question correctly corresponds to a difficulty of 529 score points on the PISA 2006 science scale. Across OECD countries, 54% of students answered correctly. This question assesses students' competencies in using scientific evidence.

GREENHOUSE SCORING 5.2

Full credit: Responses that refer to one particular part of the graphs in which the curves are not both descending or both climbing and gives the corresponding explanation, such as:

- In 1900–1910 (about) CO₂ was increasing, whilst the temperature was going down.
- In 1980–1983 carbon dioxide went down and the temperature rose.
- The temperature in the 1800's is much the same but the first graph keeps climbing.
- Between 1950 and 1980 the temperature didn't increase but the CO₂ did.
- From 1940 until 1975 the temperature stays about the same but the carbon dioxide emission shows a sharp rise.
- In 1940 the temperature is a lot higher than in 1920 and they have similar carbon dioxide emissions.

Partial credit:

- Responses that mention a correct period, without any explanation.
- Responses that mention only one particular year (not a period of time), with an acceptable explanation.
 - In 1980 the emissions were down but the temperature still rose.
- Responses that give an example that doesn't support André's conclusion but makes a mistake in mentioning the period. *[Note: There should be evidence of this mistake – e.g. an area clearly illustrating a correct answer is marked on the graph and then a mistake made in transferring this information to the text.]*
 - Between 1950 and 1960 the temperature decreased and the carbon dioxide emission increased.
- Responses that refer to differences between the two curves, without mentioning a specific period.
 - At some places the temperature rises even if the emission decreases.
 - Earlier there was little emission but nevertheless high temperature.
 - When there is a steady increase in graph 1, there isn't an increase in graph 2, it stays constant. *[Note: It stays constant "overall".]*
 - Because at the start the temperature is still high where the carbon dioxide was very low.
- Responses that refer to an irregularity in one of the graphs.
 - It is about 1910 when the temperature had dropped and went on for a certain period of time.
 - In the second graph there is a decrease in temperature of the Earth's atmosphere just before 1910.
- Responses that indicate difference in the graphs, but explanation is poor.
 - In the 1940's the heat was very high but the carbon dioxide very low.

No credit:

- Responses that refer to an irregularity in a curve without referring specifically to the two graphs.
 - It goes a little up and down.
 - It went down in 1930.
- Responses that refer to a poorly defined period or year without any explanation.
 - The middle part.
 - 1910.
- Other responses.
 - In 1940 the average temperature increased, but not the carbon dioxide emission.
 - Around 1910 the temperature has increased but not the emission.

-Missing.

Answering this question correctly corresponds to a difficulty of 659 score points on the PISA 2006 science scale. Giving a partially correct answer corresponds to a difficulty of 568 score points on the PISA 2000 science scale. Across OECD countries, 35% of students answered correctly. The question assesses students' competencies in using scientific evidence.

GREENHOUSE SCORING 5.3

Full credit:

- Responses that give a factor referring to the energy/radiation coming from the Sun.
 - The sun heating and maybe the earth changing position.
 - Energy reflected back from Earth. [*Assuming that by "Earth" the student means "the ground".*]
- Responses that give a factor referring to a natural component or a potential pollutant.
 - Water vapour in the air.
 - Clouds.
 - The things such as volcanic eruptions.
 - Atmospheric pollution (gas, fuel).
 - The amount of exhaust gas.
 - CFC's.
 - The number of cars.
 - Ozone (as a component of air).

No credit:

- Responses that refer to a cause that influences the carbon dioxide concentration.
 - Clearing of rain forest.
 - The amount of CO₂ being let off.
 - Fossil fuels.
- Responses that refer to a non-specific factor.
 - Fertilisers.
 - Sprays.
 - How the weather has been.
- Other incorrect factors or other responses.
 - Amount of oxygen.
 - Nitrogen.
 - The hole in the ozone layer is also getting bigger.
- Missing.

Answering this question correctly corresponds to a difficulty of 709 score points on the PISA 2006 science scale. Across OECD countries, 19% of students answered correctly. The question assesses students' competencies in explaining phenomena scientifically.

CLOTHES SCORING 6.1

Full credit: Yes, Yes, Yes, No, in that order.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 567 score points on the PISA 2006 science scale. Across OECD countries, 48% of students answered correctly. The question assesses students' competencies in identifying scientific issues.

4

CLOTHES SCORING 6.2

Full credit: A. Voltmeter.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 399 score points on the PISA 2006 science scale. Across OECD countries, 79% of students answered correctly. This question assesses students' competencies in explaining phenomena scientifically.

THE GRAND CANYON SCORING 7.1

Full credit: D. Freezing water expands in the rock cracks.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 451 score points on the PISA 2006 science scale. Across OECD countries, 68% of students answered correctly. The question assesses students' competencies in explaining phenomena scientifically.

THE GRAND CANYON SCORING 7.2

Full credit: C. An ocean covered this area at that time and then receded later.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 411 score points on the PISA 2006 science scale. Across OECD countries, 76% of students answered correctly. This question assesses students' competencies in explaining phenomena scientifically.

THE GRAND CANYON SCORING 7.3

Full credit: Yes, No in that order.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 485 score points on the PISA 2006 science scale. Across OECD countries, 61% of students answered correctly. The question assesses students' competencies in identifying scientific issues.

SUNSCREENS SCORING 8.1

Full credit: D. Mineral oil and zinc oxide are both reference substances.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 588 score points on the PISA 2006 science scale. Across OECD countries, 41% of students answered correctly. This question assesses students' competencies in identifying scientific issues.

SUNSCREENS SCORING 8.2

Full credit: A. How does the protection for each sunscreen compare with the others?

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 499 score points on the PISA 2006 science scale. Across OECD countries, 58% of students answered correctly. The question assesses students' competencies in identifying scientific issues.

SUNSCREENS SCORING 8.3

Full credit: D. To make the drops the same thickness.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 574 score points on the PISA 2006 science scale. Across OECD countries, 43% of students answered correctly. The question assesses students' competencies in identifying scientific issues.

SUNSCREENS SCORING 8.4

Full credit: A. with explanation that the ZnO spot has stayed dark grey (because it blocks sunlight) and the M spot has gone white (because mineral oil absorbs very little sunlight), such as:

- A. ZnO has blocked the sunlight as it should and M has let it through.

- I chose A because the mineral oil needs to be the lightest shade while the zinc oxide is the darkest.

Partial credit: A. and gives a correct explanation for either the ZnO spot or the M spot, but not both, such as:

- A. Mineral oil provides the lowest resistance against UVL. So with other substances the paper would not be white.
- A. Zinc oxide absorbs practically all rays and the diagram shows this.
- A because ZnO blocks the light and M absorbs it.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 629 score points on the PISA 2006 science scale. Giving a partially correct answer corresponds to a difficulty of 616 score points on the PISA 2006 science scale. Across OECD countries, 27% of students answered correctly. The question assesses students' competencies in using scientific evidence.

4

MARY MONTAGU SCORING 9.1

Full credit: B. Diseases that are caused by viruses, like polio.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 436 score points on the PISA 2006 science scale. Across OECD countries, 75% of students answered correctly. The question assesses students' competencies in explaining phenomena scientifically.

MARY MONTAGU SCORING 9.2

Full credit: B. The body has made antibodies that kill this type of bacteria before they multiply.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 431 score points on the PISA 2006 science scale. Across OECD countries, 75% of students answered correctly. The question assesses students' competencies in explaining phenomena scientifically.

MARY MONTAGU SCORING 9.3

Full credit: Responses referring to young and/or old people having weaker immune systems than other people, or similar, such as:

- These people have less resistance to getting sick.
- The young and old can't fight off disease as easily as others.
- They are more likely to catch the flu.
- If they get the flu the effects are worse in these people.
- Because organisms of young children and older people are weaker.

- Old people get sick more easily.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 507 score points on the PISA 2006 science scale. Across OECD countries, 62% of students answered correctly. This question assesses the students' competencies in explaining phenomena scientifically.

ACID RAIN SCORING 10.1

Full credit:

- Responses that mention any one of: car exhausts, factory emissions, *burning* fossil fuels such as oil and coal, gases from volcanoes or other similar things.
 - Burning coal and gas.
 - Oxides in the air come from pollution from factories and industries.
 - Volcanoes.
 - Fumes from power plants.
 - They come from the burning of materials that contain sulfur and nitrogen.
- Responses that include an incorrect as well as a correct source of the pollution.
 - Fossil fuel and nuclear power plants. [*Nuclear power plants are not a source of acid rain.*]
 - The oxides come from the ozone, atmosphere and meteors coming toward Earth. Also the burning of fossil fuels.
- Responses that refer to "pollution" but do not give a source of pollution that is a significant cause of acid rain.
 - Pollution.
 - The environment in general, the atmosphere we live in – e.g., pollution.
 - Gasification, pollution, fires, cigarettes.
 - Pollution such as from nuclear power plants.

No credit:

- Other responses, including responses that do not mention "pollution" and do not give a significant cause of acid rain.
 - They are emitted from plastics.
 - They are natural components of air.
 - Cigarettes.
 - Coal and oil. [*Not specific enough – no reference to "burning".*]
 - Nuclear power plants.
 - Industrial waste. [*Not specific enough.*]

- Missing.

Answering this question correctly corresponds to a difficulty of 506 score points on the PISA 2006 science scale. Across OECD countries, 58% of students answered correctly. The question assesses students' competencies in explaining phenomena scientifically.

ACID RAIN SCORING 10.2

Full credit: A. Less than 2.0 grams

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 460 score points on the PISA 2006 science scale. Across OECD countries, 67% of students answered correctly. This question assesses students' competencies in using scientific evidence.

4

ACID RAIN SCORING 10.3

Full credit: Responses such as:

- To show that the acid (vinegar) is necessary for the reaction.
- To make sure that rainwater must be acidic like acid rain to cause this reaction.
- To see whether there are other reasons for the holes in the marble chips.
- Because it shows that the marble chips don't just react with any fluid since water is neutral.

Partial credit: Responses which compare with the test of vinegar and marble, but do not make clear that this is being done to show that the acid (vinegar) is necessary for the reaction.

- To compare with the other test tube.
- To see whether the marble chip changes in pure water.
- The students included this step to show what happens when it rains normally on the marble.
- Because distilled water is not acid.
- To act as a control.
- To see the difference between normal water and acidic water (vinegar).

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 717 score points on the PISA 2006 science scale. Giving a partially correct answer corresponds to a difficulty of 513 score points on the PISA 2000 science scale. Across OECD countries, 36% of students answered correctly. The question assesses students' competencies in identifying scientific issues.

PHYSICAL EXERCISE SCORING 11.1

Full credit: Yes, No, Yes in that order.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 545 score points on the PISA 2006 science scale. Across OECD countries, 57% of students answered correctly. The question assesses students' competencies in explaining phenomena scientifically.

PHYSICAL EXERCISE SCORING 11.2

Full credit: Yes, No in that order.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 386 score points on the PISA 2006 science scale. Across OECD countries, 82% of students answered correctly. This question assesses students' competencies in explaining phenomena scientifically.

PHYSICAL EXERCISE SCORING 11.3

Full credit:

- To remove *increased* levels of carbon dioxide **and** to supply *more* oxygen to your body. [*Do not accept "air" instead of "carbon dioxide" or "oxygen".*]

- When you exercise your body needs more oxygen and produces more carbon dioxide. Breathing does this.
- Breathing faster allows more oxygen into the blood and more carbon dioxide to be removed.

- To remove *increased* levels of carbon dioxide from your body **or** to supply *more* oxygen to your body, but not both. [*Do not accept "air" instead of "carbon dioxide" or "oxygen".*]

- Because we must get rid of the carbon dioxide that builds up.
- Because the muscles need oxygen. [*The implication is that your body needs more oxygen when you are exercising (using your muscles).*]
- Because physical exercise uses up oxygen.
- You breathe more heavily because you are taking more oxygen into your lungs. [*Poorly expressed, but recognises that you are supplied with more oxygen.*]
- Since you are using so much energy your body needs double or triple the amount of air intake. It also needs to remove the carbon dioxide in your body.

No credit:

- Other responses, such as:

- To get more air in your lungs.

- Because muscles consume more energy. *[Not specific enough.]*
- Because your heart beats faster.
- Your body needs oxygen. *[Does not refer to the need for more oxygen.]*

- Missing.

Answering this question correctly corresponds to a difficulty of 583 score points on the PISA 2006 science scale. Across OECD countries, 45% of students answered correctly. This question assesses students' competencies in explaining phenomena scientifically.

GM CROPS SCORING 12.1

Full Credit: Both correct: No, Yes in that order.

No Credit: Other responses and missing.

GM CROPS SCORING 12.2

Full credit: D. To include various growth conditions for corn.

No credit: Other responses and missing.

Answering this question correctly corresponds to a difficulty of 421 score points on the PISA 2006 science scale. Across OECD countries, 74% of students answered correctly. The question assesses students' competencies in identifying scientific issues.

BIODIVERSITY SCORING 13.1

Full credit: A. Native Cat and Parasitic Wasp.

No credit: Other responses and missing.

The process being assessed is demonstrating knowledge and understanding.

BIODIVERSITY SCORING 13.2

Full credit: C. The effect would be greater in food web B because the Parasitic Wasp has only one food source in web B.

No credit: Other responses and missing.

The process being assessed is drawing or evaluating conclusions.

BUSES SCORING 14.1

Full credit: C. The water will spill over side 2.

No credit: Other responses and missing.

The process being assessed is demonstrating knowledge and understanding.

BUSES SCORING 14.2

Full credit: Gives an answer in which it is stated that the power station also contributes to environmental pollution, such as:

- No, because the power station causes environmental pollution as well.
- Yes, but this is only true for the city itself; the power station however causes environmental pollution.

No credit: No or yes without a correct explanation and missing.

The process being assessed is demonstrating knowledge and understanding.

CLIMATE CHANGE SCORING 15.1

Full credit: Carbon dioxide is the main factor causing an increase in atmospheric temperature/causing climatic change, so reducing the amount emitted will have the greatest effect in reducing the impact of human activities.

- The emission of CO₂ causes significant heating to the atmosphere and therefore should be lessened. [Note: The term “significant” can be considered as equivalent to “most”.]
- According to figure 1 reduction in the emission of carbon dioxide is necessary because it considerably heats the earth. [Note: The term “considerable” can be considered as equivalent to “most”.]

Partial credit: Carbon dioxide is causing an increase in atmospheric temperature/causing climatic change.

- The burning of fossil fuel such as oil, gas and coal are contributing to the build up of gases in the atmosphere, one of which is carbon dioxide (CO₂). This gas affects the temperature of the earth which increases causing a greenhouse effect.

No credit: Other responses, including that an increase in temperature will have a bad effect on the Earth, and missing.

The question assesses the ability to communicate conclusions based on evidence.

FLIES SCORING 16.1

Full credit: Responses in which three variables (type of flies, age of insecticide, and exposure) are controlled, such as:

- Compare the results from a new batch of the insecticide with results from the old batch on two groups of flies of the same species that have not been previously exposed to the insecticide.
- Some flies could be taken. If they would both be put in a separate box you could use a new spray and an older spray and see what the results are. *[Note: Although the same species is not mentioned, it is implied that the flies are the same type, and that the flies have not been previously exposed.]*
- Make one big batch of spray. Have 2 groups of flies and spray each group every six months. Spray groups one with the big batch, and group 2 a new batch each time. *[Note: Although the same species is not mentioned, it is implied that the flies are the same type, and that the flies have not been previously exposed.]*

Partial credit:

- Responses in which two of the three variables (type of flies, age of insecticide, and exposure) are controlled, such as:
 - Compare the results from a new batch of the insecticide with the results from the old batch on the flies in the barn.
 - Try a new bottle of it, then wait till it gets a bit older and the flies come back and then try again. *[Note: Reproduction of what the farmer experienced, controlling the age of the insecticide and type of flies (“the flies” is interpreted to mean the same flies).]*
- Responses in which one variable only of three variables (type of flies, age of insecticide, and exposure) is controlled, such as:
 - (Chemically) analyse samples of the insecticide at regular intervals to see if it changes over time.
 - Take batches of the insecticide to a laboratory every few months and have its strength tested.
 - Spray the flies with a new batch of insecticide, but without mentioning comparison with old batch.
 - Do the same thing but buy new insecticide each time, hence proving if his theory is right or wrong.
 - (Chemically) analyse samples of the insecticide but without mentioning comparison of analyses over time.
 - Maybe if he sent a fresh batch of the poison to the lab with a batch of the old stuff and get them retested the results may prove his theory.

No credit: Other responses and missing.

- He could test it every year to see if it is not old and would still work. *[Note: Does not indicate how the insecticide would be tested.]*

- Get a fly from his shed and another shed and spray them each with the insecticide.

The process being assessed is identifying evidence.

FLIES SCORING 16.2

Full credit: Responses that gives as one explanation a) that flies with resistance to the insecticide survive and pass on that resistance to later generations (also credit for “immunity” although it is recognised that it is not strictly analogous to “resistance”), as well as one of these b): a change in the environmental conditions (such as temperature), or a change in the way the insecticide was applied.

- Explanation 1: With the repeated use of the same insecticide the flies were becoming immune to the formula. Explanation 2: Over time chemicals in the insecticide rose to the top of spray can leaving water diluted (ineffective) at the bottom.
- Explanation 1: The flies were becoming immune to the spray. Explanation 2: Heat may make it decompose and temperature change.
- Explanation 1: Maybe the flies developed a defence gene so the insecticide would not work. Explanation 2: He (the farmer) used less each time. *[Note: Defence gene is allowed as an alternative to resistance.]*

Partial credit: Gives one explanation of type a) or type b).

- He might not have sprayed it properly.
- The flies could have built up an immunity.
- There were different types of flies each time. *[Note: A clear distinction is made between different types of flies in this example; it is not referring to new flies coming into the area.]*
- Explanation 1: The temperature got very hot and affected the insecticide. Explanation 2: the farmer did not spray the insecticide on the flies properly

No credit: Other responses, including new flies moving to the barn from nearby (unsprayed) areas, and missing.

- The flies could have been breeding.
- Because everytime he sprayed it it became less and less effective.
- When there is more of it in the can it is stronger. *[Note: A clear relationship between volume and concentration is not given.]*

The process being assessed is recognising questions.

CALF CLONES SCORING 17.1

Full credit: Responses that gives an acceptable main idea, such as:

- The idea of whether cloning of calves is possible.
- The determination of the number of calf clones that could be produced.
- That cloning was possible. *[Note: The fact that calves/cows have not been mentioned should be disregarded.]*

No credit: Gives an answer without mentioning calves or cloning OR repeats “a large scale application of this cloning technique could be financially beneficial for cattle breeders” and missing.

- That all cells of cows are the same.
- Mass cloning could be achieved. *[Note: The word “mass” in this context is not correct.]*

The process being assessed is recognising questions.

CALF CLONES SCORING 17.2

Full credit: Yes, Yes, Yes.

No credit: Other responses and missing.

The process being assessed is evaluating conclusions.

CORN SCORING 18.1

Full credit: Yes, Yes, Yes.

No credit: Other responses and missing.

CORN SCORING 18.2

Full credit: One of the following names: glucose, sugar(s), carbohydrate(s), saccharide(s) or starch.

No credit: Other responses and missing.

CORN SCORING 18.3

Full credit: D. Data about the amounts of each of the four gases in the atmosphere.

No credit: Other responses and missing.

FIT FOR DRINKING SCORING 19.1

Full credit:

- Responses referring to ground water being filtered through the ground
 - When it goes through sand and dust the water is cleaned.
 - It has been naturally filtered.
 - Because when water goes down through the ground it will be strained by rocks and sand.
- Responses referring to the ground water being encapsulated and therefore protected from possible pollution; OR that surface water is more easily polluted
 - Ground water is inside the earth and therefore air pollution cannot make it dirty.
 - Because ground water isn't open, it is located under something.
 - Lake and rivers can be polluted by the air and you can swim in it and so on, that's why it is not clean.
 - Because lakes and rivers are polluted by people and animals.
- Other correct responses, such as:
 - Ground water is water without much food for bacteria so they will not survive there.
 - Ground water is not in the Sun. There is blue-green algae.

No credit:

- Responses referring to ground water being very clean (information already given)
 - Because it has been cleaned.
 - Because there is rubbish in lakes and rivers. [*Does not explain why.*]
 - Because there is less bacteria.
- Responses obviously referring to the cleaning process provided in the figure given in the stimulus
 - Because ground water passes through a filter and chlorine is added.
 - The ground water passes through a filter that cleans it absolutely.
- Other responses, such as:
 - Because it's always moving.
 - Because it is not stirred and therefore doesn't bring mud from the bottom.
- Missing.

The competency being assessed is explaining phenomena scientifically.

FIT FOR DRINKING SCORING 19.2

Full credit: C. Gravel and sand sink to the bottom.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

FIT FOR DRINKING SCORING 19.3

Full credit: Responses referring to removing, killing or breaking down bacteria (or microbes or viruses or germs)

- To make it free from bacteria.
- Chlorine kills bacteria.
- To kill all the algae.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

FIT FOR DRINKING SCORING 19.4

Full credit:

- Responses referring to boiling the water
 - Boil it.
- Responses referring to other methods of cleaning that are possible to do safely at home
 - Treat the water with chlorine tablets (e.g., Puratabs).
 - Use a micropore filter.

No credit:

- Responses referring to “professional” methods of cleaning that are impossible to carry out safely at home, or impractical to carry out at home
 - Mix it with chloride in a bucket and then drink it.
 - More chloride, chemicals and biological devices.
 - Distil the water.
- Other responses
 - Purify it again.
 - Use a coffee filter.
 - Buy bottled water until the cleaning process is fixed. *[Avoids the question being asked.]*

- Missing

The competency being assessed is explaining phenomena scientifically.

FIT FOR DRINKING SCORING 19.5

Full credit: All three correct: No, Yes, No, in that order.

No credit: Other responses and missing.

While classified as explaining phenomena scientifically, this question is a low-level form of this competency because it can be answered by simple recall of knowledge.

TOOTH DECAY SCORING 20.1

Full credit: D. Bacteria produce acid.

No credit: Other responses and missing.

Students are required to select a conclusion based on the given information, so the question assesses the competency of using scientific evidence.

TOOTH DECAY SCORING 20.2

Full credit: B. The more sugar people eat, the more likely they are to get caries.

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

TOOTH DECAY SCORING 20.3

Full credit: Yes, No in that order.

No credit: Other responses and missing.

The competency being assessed is identifying scientific issues.

HOT WORK SCORING 21.1

Full credit: Yes, No, No, in that order.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

HOT WORK SCORING 21.2

Full credit: A. 70 °C and 10 °C

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

MOUSEPOX SCORING 22.1

Full credit: B. A mutation in mousepox DNA might allow the virus to infect other animals.

No credit: Other responses and missing.

The scientific process being assessed is explaining phenomena scientifically.

MOUSEPOX SCORING 22.2

Full credit: Yes, No, Yes in that order.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

MOUSEPOX SCORING 22.3

Full credit: Yes, Yes, Yes.

No credit: Other responses and missing.

This question assesses both the competencies of explaining phenomena scientifically and of identifying scientific issues.

STICKLEBACK BEHAVIOUR SCORING 23.1

Full credit: Questions such as:

- What colour elicits the strongest aggressive behaviour by the male stickleback?
- Does the male stickleback react more aggressively to a red-coloured model than to a silver-coloured one?
- Is there a relationship between colour and aggressive behaviour?
- Does the colour of the fish cause the male to be aggressive?
- What fish colour does the stickleback find most threatening?

No credit:

- Other responses (including all responses that do not refer to the *colour* of the stimulus/model/fish).
 - What colour will elicit aggressive behaviour in the male stickleback. [*No comparative aspect.*]
 - Does the colour of the female stickleback determine the aggressiveness of the male? [*The first experiment is not concerned with the gender of the fish.*]
 - Which model does the male stickleback react to most aggressively? [*Specific reference must be made to the colour of the fish/model.*]
- Missing.

The competency being assessed is identifying scientific issues.

4

STICKLEBACK BEHAVIOUR SCORING 23.2

Full credit: No, No, Yes in that order.

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

STICKLEBACK BEHAVIOUR SCORING 23.3

Full credit: C, A, C, B in that order.

Partial credit: Three of the four entries correct.

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

TOBACCO SMOKING SCORING 24.1

Full credit: B. To transfer oxygen from the air that you breathe to your blood.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

TOBACCO SMOKING SCORING 24.2

Full credit: Yes, No, No in that order.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

TOBACCO SMOKING SCORING 24.3

Full credit: D. Half are randomly chosen to use patches and the other half do not use them.

No credit: Other responses and missing.

The competency being assessed is identifying scientific issues.

TOBACCO SMOKING SCORING 24.4

Full credit: No, Yes, No in that order

No credit: Other responses and missing.

The competency being assessed is identifying scientific issues.

STARLIGHT SCORING 25.1

Full credit: C. The brightness of city lights makes many stars hard to see.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

STARLIGHT SCORING 25.2

Full credit: A. The larger the lens the more light is collected.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

ULTRASOUND SCORING 26.1

Full credit: Responses such as:

- It must measure the time the ultrasound wave takes to travel from the probe to the surface of the foetus and reflect back.
- The time of travel of the wave.
- The time.
- Time. Distance = speed / time. *[Although the formula is incorrect, the student has correctly identified "time" as the missing variable.]*
- It must find when the ultrasound finds the baby.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

4

ULTRASOUND SCORING 26.2

Full credit: Responses such as:

- X-rays are harmful to the foetus.
- X-rays hurt the foetus.
- X-rays might cause a mutation in the foetus.
- X-rays can cause birth defects in the foetus.
- Because the baby could get some radiation.

No credit:

- Other responses.

- X-rays do not give a clear picture of the foetus.
- X-rays emit radiation.
- The child can get Down syndrome.
- Radiation is harmful. *[This is not enough. Potential harm to the foetus (baby) must be explicitly mentioned.]*
- They may make it harder for her to have another baby. *[This is a reason for avoiding over-exposure to X-rays in general.]*

- Missing.

The competency being assessed is explaining phenomena scientifically.

ULTRASOUND SCORING 26.3

Full credit: Yes, No, Yes in that order.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

LIP GLOSS SCORING 27.1

Full credit: Responses indicating that you would add less wax AND/OR add more oil

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

LIP GLOSS SCORING 27.2

Full credit: D. Fatty lumps of the mixture float on the water.

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

LIP GLOSS SCORING 27.3

Full credit: B. The soap acts as an emulsifier and allows the water and lipstick to mix.

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

EVOLUTION SCORING 28.1

Full credit: Responses that refer to gradual change (progression) in leg skeleton structure over time, such as:

- The leg skeletons are much the same but have gradually changed.
- The digits/toes fused during the period 55 to 2 million years ago.
- The number of digits has decreased.

No credit:

- Other responses, such as:

- The leg has changed. *[Not specific enough.]*
- They are called *Hippus*.

- Genetic mutations have caused the transformations. *[Correct, but does not answer the question.]*
- The leg bones are similar. *[Need to mention or imply “gradual change”.]*

- Missing.

The competency being assessed is using scientific evidence.

EVOLUTION SCORING 28.2

Full credit: No, Yes in that order.

No credit: Other responses and missing.

The competency being assessed is identifying scientific issues.

4

EVOLUTION SCORING 28.3

Full credit: C. Evolution is a scientific theory that is currently based on extensive evidence.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

BREAD DOUGH SCORING 29.1

Full credit: C. The dough rises because a gas, carbon dioxide, is produced.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

BREAD DOUGH SCORING 29.2

Full credit: D. The cook should compare experiments 3 and 4.

No credit: Other responses and missing.

The competency being assessed is identifying scientific issues.

BREAD DOUGH SCORING 29.3

Full credit: Yes, No, No in that order.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

BREAD DOUGH SCORING 29.4

Full credit: B. Their molecules move faster.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

TRANSIT OF VENUS SCORING 30.1

Full credit: C. Viewing the Sun through a telescope may damage your eyes.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

TRANSIT OF VENUS SCORING 30.2

Full credit: A. Mercury.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

TRANSIT OF VENUS SCORING 30.3

Full credit: Responses referring to transit/Saturn/Neptune only.

No credit: Other responses and missing.

Identifying keywords to search for scientific information on a given topic is a component of the competency identifying scientific issues.

HEALTH RISK SCORING 31.1

Full credit: An appropriate reason is given for doubting that the statement supports the owner's argument, such as:

- The substance causing the breathing problems may not have been recognised as toxic.
- Breathing problems may have been caused only when chemicals were in the air, not in the soil.
- Toxic substances may change/break down with time and show up as non-toxic substances in soil.
- We do not know if the samples are representative of the area.
- Because the scientists are being paid by the company.
- The scientists feared losing their jobs.

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

HEALTH RISK SCORING 31.2

Full credit: Responses should focus on possible relevant differences between the areas investigated, such as:

- The number of people in the two areas might be different.
- One area could have better medical services than the other.
- There could be different proportions of elderly people in each area.
- There might be other air pollutants in the other area.

No credit: Other responses and missing.

The competency being assessed is identifying scientific issues.

CATALYTIC CONVERTER SCORING 32.1

Full credit: Responses such as:

- The conversion of carbon monoxide, or nitrogen oxides, to other compounds is mentioned.
- Carbon monoxide is changed into carbon dioxide.
- Nitrogen oxides are changed into nitrogen.
- It changes harmful fumes into non-harmful fumes. E.g., CO into CO₂ (90%).
- Carbon dioxide and nitrogen are not as harmful as carbon monoxide and nitrogen oxides.

No credit:

- Other responses, such as:

- The gases become less harmful.
- It purifies the carbon monoxide and nitrogen oxides. *[Not specific enough.]*

- Missing

The competency being assessed is using scientific evidence.

CATALYTIC CONVERTER SCORING 32.2

4

Full credit: Answers which express the essential idea that atoms are rearranged to form different molecules (using both of these words), such as:

- Molecules break up and atoms are re-combined to form different molecules.
- Atoms rearrange to make different molecules.

Partial credit: Answers which express the essential idea of rearrangement, but does not refer to both atoms and molecules OR does not distinguish sufficiently between the roles of atoms and molecules, such as:

- Atoms rearrange to make different substances.
- Molecules are changing into other molecules.
- Atoms and molecules are combining and separating to make less harmful gases. *[The different roles of atoms and molecules are not sufficiently distinguished.]*
- $2(\text{NO}_2) = \text{N}_2 + 2\text{O}_2$.

No credit:

- Other responses, including those that state no more than is given in the stimulus.

- Carbon dioxide is changed into carbon monoxide.
- The molecules are being broken down into smaller atoms. *[No indication that atoms are rearranged.]*

- Missing.

The competency being assessed is explaining phenomena scientifically.

CATALYTIC CONVERTER SCORING 32.3

Full credit: Acceptable responses should relate to achieving a reduction in harmful gases entering the atmosphere.

- Not all the carbon monoxide is converted into carbon dioxide.
- Not enough conversion of nitrogen oxides to nitrogen is taking place.

- Improve the percentage of carbon monoxide being converted to carbon dioxide and the percentage of nitrogen oxides being converted to nitrogen.
- The carbon dioxide produced should be captured and not allowed to escape into the atmosphere.

No credit:

- Other responses, such as:

- More complete conversion of the harmful gases to less harmful ones. [At least one of the harmful exhaust gases must be identified.]
- They need to try and have less fumes coming out.
- They should find a way to re-use harmful exhaust gases.
- They should try and make a vehicle that runs on a different liquid fuel.

- Missing

The competency being assessed is using scientific evidence.

4

MAJOR SURGERY SCORING 33.1

Full credit: No, Yes, Yes in that order.

No credit: Other response and missing.

The competency being assessed is explaining phenomena scientifically.

MAJOR SURGERY SCORING 33.2

Full credit: Student mentions both the need to ensure that there are no bacteria/germs on the instruments AND that this stops the spread of disease.

- To stop bacteria getting in the body and infecting the patient.
- So that no germs get into the body of another person going in for major surgery.

Partial credit:

- Student mentions the need to ensure that there are no bacteria, BUT not that this stops the spread of disease.

- To kill the germs on them.

- Student mentions that this stops the spread of disease, BUT not that it is because any bacteria on the instruments are killed.

- So the patient is not infected.
- To prevent any transfer of disease.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

MAJOR SURGERY SCORING 33.3

Full credit: D. To provide necessary nutrition.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

4

MAJOR SURGERY SCORING 33.4

Full credit: No, No, Yes in that order.

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

WIND FARMS SCORING 34.1

Full credit: C.

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

WIND FARMS SCORING 34.2

Full credit: B.

No credit: Other responses and missing.

The competency being assessed is using scientific evidence.

WIND FARMS SCORING 34.3

Full credit: A. The air is less dense as altitude increases.

No credit: Other responses and missing.

The competency being assessed is explaining phenomena scientifically.

WIND FARMS SCORING 34.4**Full credit:**

One specific advantage and one specific disadvantage are described.

Advantage:

- Do not discharge carbon dioxide (CO₂).
- Do not consume fossil fuels.
- The wind resource will not be used up.
- After the wind generator is established, the cost for electric generation is cheap.
- No waste and/or no toxic substance will be emitted.
- Using natural forces or clean energy.
- Environmentally friendly and will last for a very long time.

Disadvantage:

- Generation on demand is not possible. [*Because the wind speed cannot be controlled.*]
- Good places for windmills are limited.
- The windmill could be damaged by too strong wind.
- The amount of power generated by each windmill is relatively small.
- Noise pollution occurs in some cases.
- Birds are sometimes killed when they crash into the rotors.
- Natural views are altered. [*Visual pollution.*]
- Expensive to set up.

Partial credit: Either a correct advantage or a correct disadvantage is described (as shown in the full credit examples) but not both.

No credit: No correct and precise advantage or disadvantage is described.

The competency being assessed is explaining phenomena scientifically.