2.5 The Earth and its Atmosphere: 30-minute Pack

Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 List three stages of the carbon cycle that move carbon between the atmosphere and living organisms. Give a short phrase for each stage.

(3)

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2 Between 1990 and 2010 a country reduced its coal use and cut CO_2 emissions from 800 million tonnes to 640 million tonnes. Calculate the percentage reduction in CO_2 emissions to the nearest whole percent.

(3)

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3 A long-term monitoring station records the following average monthly CO_2 values (ppm) for four months: April 412.0, May 410.5, June 411.0, July 416.5. One value appears anomalous compared with a seasonal pattern of spring decreases then a gradual summer increase. Identify the anomalous value and give one possible experimental reason for this anomaly.

(2)

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4 Design a simple fair test to investigate how the temperature of water affects the rate at which carbon dioxide is released from a solution of effervescent tablet in water. In your answer state the independent variable, dependent variable, two controls and a step-by-step outline of the method (4 steps).

(4)

5 Stretch: Explain how the composition of the atmosphere has changed since the early Earth and two consequences of that change for life on the planet.

(4)

6 Give one reason why oxygen is essential for most animals on Earth.

(3)

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7 Priya collects samples of air from a school lab and from a busy road. She tests both samples for the presence of carbon dioxide, oxygen and nitrogen. Write which gas you would expect to be higher in the busy road sample compared with the lab sample, and give a short reason for each of the three gases listed.

(3)

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8 A scientist plots a line graph of global average temperature anomaly (°C) against year for a 20-year period and finds the line slopes upward. Describe two conclusions that can be drawn from an upward sloping line in this context. Each conclusion must relate to the trend described.

(4)

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Mark scheme · 2.5 The Earth and its Atmosphere: 30-minute Pack

Question 1

photosynthesis: plants take in CO_2 to make sugars	B1
respiration: organisms release CO_2 when they respire	B1
decomposition: dead organisms and waste are broken down, releasing CO_2	B1

Answer: **Photosynthesis (plants take in CO_2); respiration (organisms release CO_2); decomposition (dead matter broken down releasing CO_2).**

Question 2

method: (800 - 640) / 800 x 100	M1
20% cao	A1
work shown or statement of calculation to nearest whole percent	B1

Answer: **20%**

Question 3

identify anomalous value: July 416.5 (an unexpectedly large jump that does not fit the gradual increase seen from May to June)	B1
give experimental reason: instrument calibration error, local contamination near sampling inlet, or data entry error, oe	B1

Answer: **Anomalous value: July 416.5 ppm. Possible reason: instrument calibration error or local contamination at sampling causing an unexpectedly high reading.**

Question 4

independent variable: temperature of water named with range or values	B1
dependent variable: rate of CO_2 release measured as time to finish fizzing or volume of gas per time	B1
two controls named such as same mass of tablet, same volume of water, same container size, same stirring	M1
method with 4 clear steps that would produce fair comparable results	A1

Answer: **Independent: water temperature. Dependent: rate of CO_2 release (eg time for tablet to dissolve). Controls: same mass of tablet and same volume of water. Method: 1) Measure and pour equal volumes of water at set temperatures into identical beakers. 2) Add a tablet of identical mass and start a stopwatch. 3) Record time until fizzing stops or CO_2 collection amount each 10 s. 4) Repeat for each temperature and average results.**

Question 5

statement that early atmosphere had little oxygen and more volcanic gases like CO_2, water vapour and nitrogen	M1
statement that photosynthetic organisms increased oxygen and reduced CO_2 over time	M1
consequence: oxygen allowed evolution of aerobic respiration and more complex life	A1
consequence: reduction in CO_2 helped climate stabilise or allowed formation of ozone protecting life from UV, oe	A1

Answer: **Early atmosphere had little oxygen and more CO_2 and water vapour from volcanoes; photosynthesis increased oxygen and lowered CO_2 over time, allowing aerobic respiration and the evolution of more complex life and contributing to ozone formation that protected life from UV.**

Question 6

statement that animals use oxygen for respiration (cellular respiration)	M1
explanation that respiration releases energy from food for movement and body processes	A1
example linking oxygen use to a named process or effect, eg breathing or muscles working, oe	B1

Answer: **Animals use oxygen for respiration; respiration releases energy from food so animals can move and keep warm; for example breathing supplies oxygen so muscles can work.**

Question 7

carbon dioxide higher at busy road with reason: vehicle exhausts release CO_2	B1
oxygen slightly lower at busy road with reason: oxygen used in combustion in engines	B1
nitrogen about the same with reason: nitrogen is not greatly changed by traffic emissions	B1

Answer: **CO_2 higher (car exhausts release CO_2); O_2 slightly lower (combustion uses O_2 in engines); N_2 about the same (nitrogen is abundant and not greatly affected by traffic).**

Question 8

conclusion that temperature anomaly increases over the 20-year period (trend upward)	M1
explain that average temperatures are becoming higher compared with the baseline	A1
conclusion that recent years are generally warmer than earlier years in the plot	M1
explain that this may indicate a warming trend in the climate record shown	A1

Answer: **The temperature anomaly rises over the period, showing average temperatures are higher than earlier years; recent years are generally warmer than earlier ones, indicating a warming trend.**

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