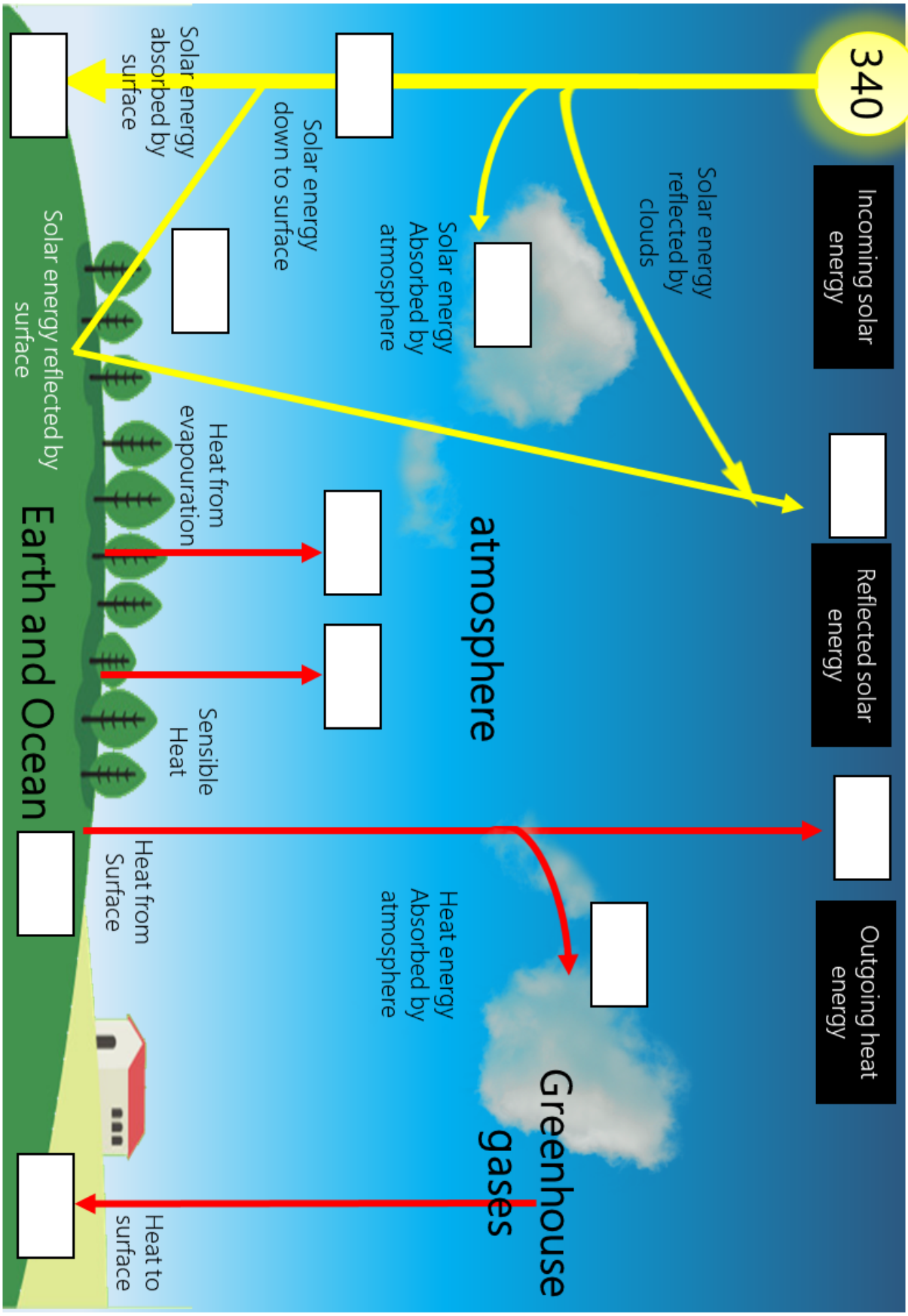


Energy budget values based on IPCC AR5

Adapted from http://www.ces.fau.edu/nasa/

Earth's Energy Budget

Junior Science

GZ Science Resources

1. Add the values to the correct labels on the diagram

Contribution	Energy (Watts/m^2)
TOTAL Incoming solar energy	340
TOTAL Reflected Solar energy	100
Solar energy absorbed by atmosphere	79
Solar energy down to surface	185
Solar energy reflected by surface	24
Solar energy absorbed by surface	161
Heat from Evaporation	84
Sensible heat	20
TOTAL Outgoing heat (thermal) energy	239
Heat (Thermal) energy up from surface	398
Heat (Thermal) energy down from surface	342

2. Calculating Earth's Energy Budget

Total of all Solar (light) energy into Earth's atmosphere		Total of all outgoing solar (light) energy from Earth's atmosphere	
		Total of all heat (thermal) energy leaving Earth's atmosphere	
TOTAL of all energy reaching Earth's atmosphere		TOTAL of all energy leaving Earth's surface	

3. Difference in energy IN and energy OUT _____w/m^2 in the atmosphere

4. What effect will this difference have on Earth's overall energy, and therefore temperature?

_____

_____

_____

_____

5. Discuss what might happen to the Earth's energy budget in these two following scenarios

a. Increase of Carbon dioxide emissions (Greenhouse gas)

b. Decrease of land ice from increasing warming, reducing light reflected by surface (Albedo effect)

_____

_____

_____

_____

_____

Energy budget values based on IPCC AR5

Earth's Energy Budget Junior Science

1. Add the values to the correct labels on the diagram

Contribution	Energy (Watts/m^2)
TOTAL Incoming solar energy	340
TOTAL Reflected Solar energy	100
Solar energy absorbed by atmosphere	79
Solar energy down to surface	185
Solar energy reflected by surface	24
Solar energy absorbed by surface	161
Heat from Evaporation	84
Sensible heat	20
TOTAL Outgoing heat (thermal) energy	239
Heat (Thermal) energy up from surface	398
Heat (Thermal) energy down from surface	342

2. Calculating Earth's Energy Budget

Total of all Solar (light) energy down to Earth's surface		Total of all solar (light) energy reflected from Earth	
Total of all heat (thermal) energy to Earth's surface		Total of all heat (thermal) energy leaving Earth	
TOTAL of all energy reaching Earths surface		TOTAL of all energy leaving Earth's surface	

3. Difference in energy IN and energy OUT _____w/m^2 onto **Earth's surface**

4. What effect will this difference have on Earth's overall energy, and therefore temperature?

_____

_____

_____

_____

5. Discuss what might happen to the Earth's energy budget in these two following scenarios
a. Increase of Carbon dioxide emissions (Greenhouse gas)
b. Decrease of land ice from increasing warming, reducing light reflected by surface (Albedo effect)

_____

_____

_____

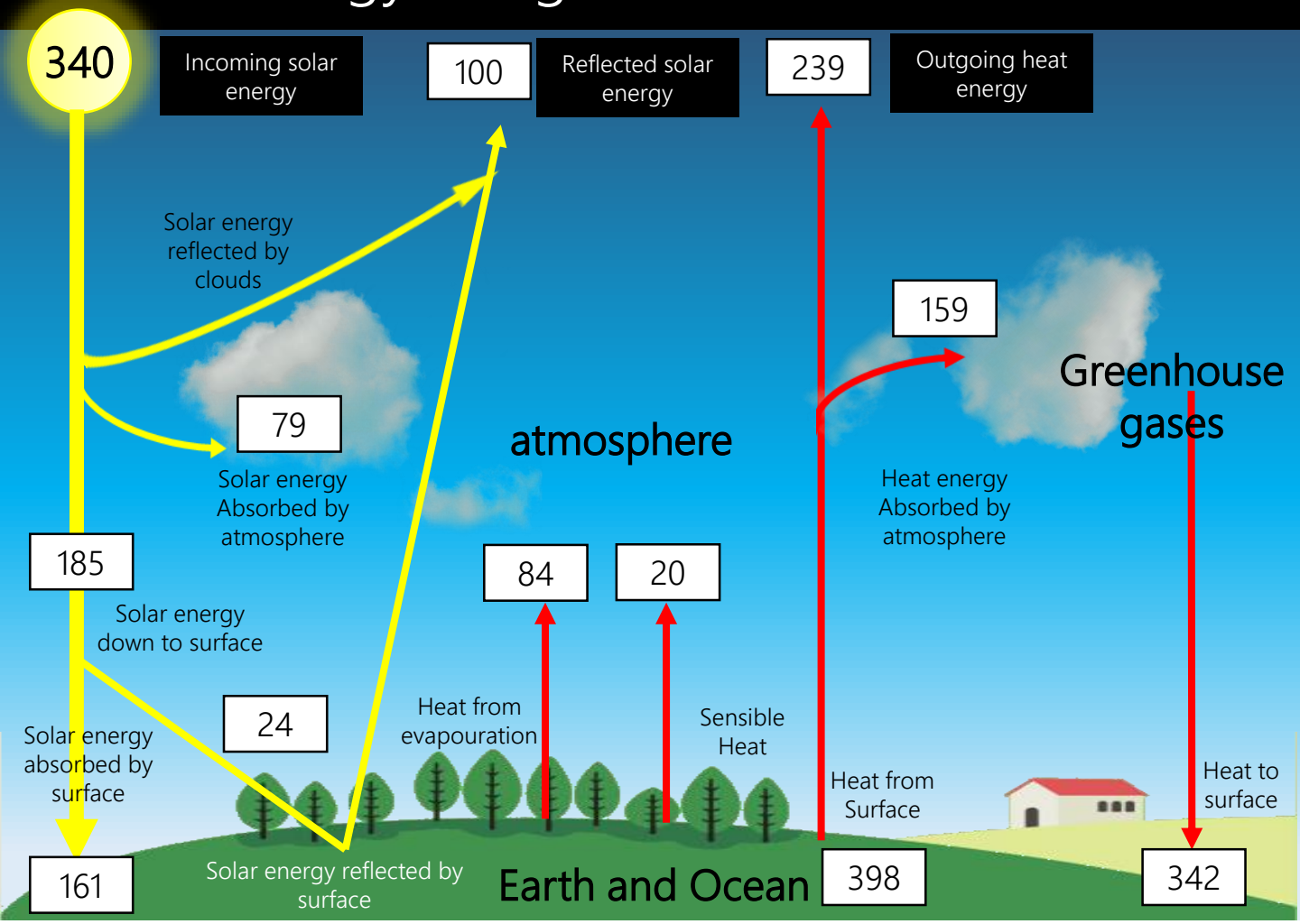
_____

_____

Energy budget values based on IPCC AR5

Earth's Energy Budget

Answers



1. Calculating Earth's Energy Budget

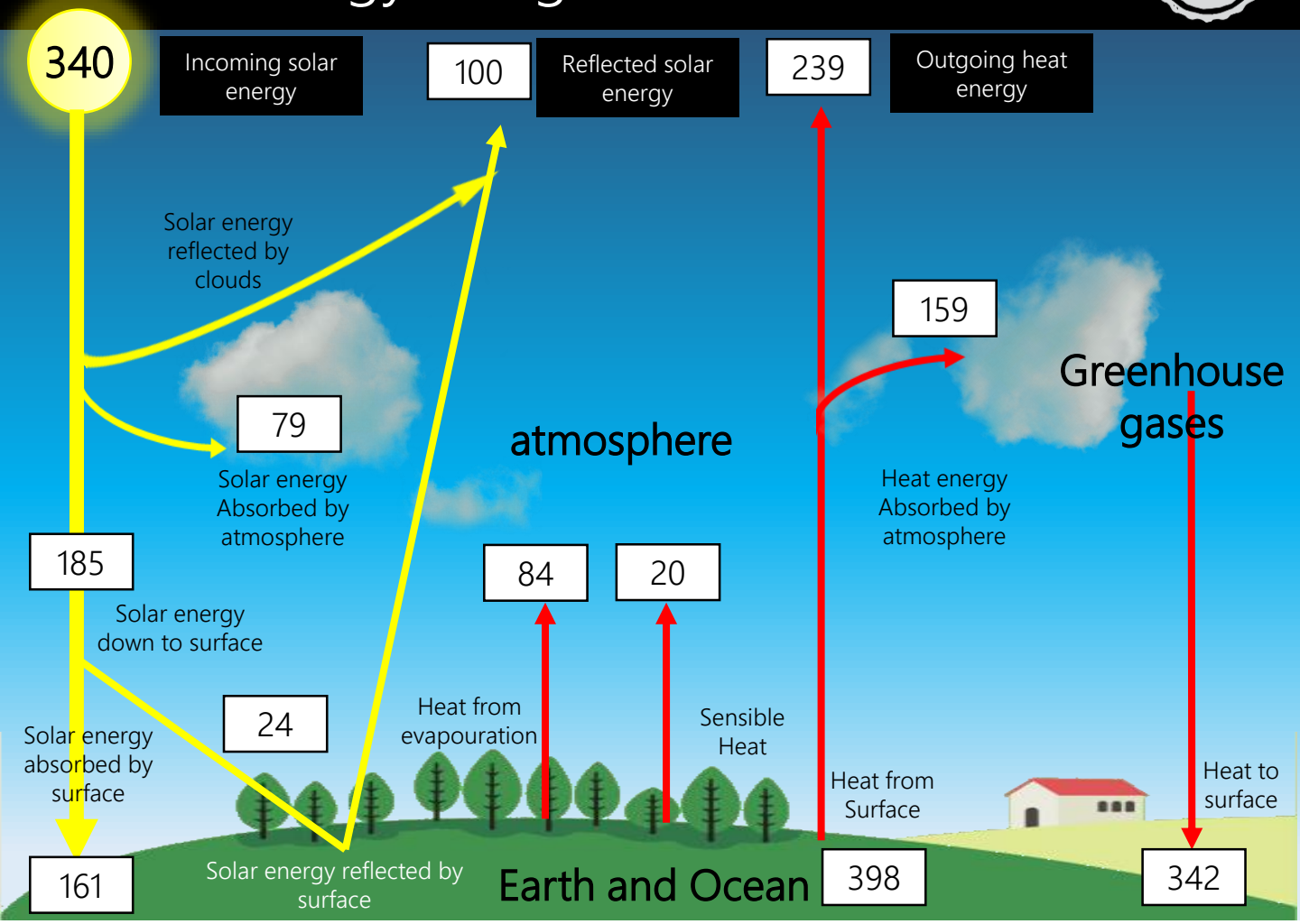
Total of all Solar (light) energy into Earth's atmosphere	340	Total of all outgoing solar (light) energy from Earth's atmosphere	100
		Total of all heat (thermal) energy leaving Earth's atmosphere	239
TOTAL of all energy reaching Earth's atmosphere	340	TOTAL of all energy leaving Earth's surface	339

2. Difference in energy IN and energy OUT 1 w/m^2 into Earth's atmosphere

Incoming solar TOA (at the top of the atmosphere) = average solar radiation impinging on top of Earth's atmosphere
Solar reflected TOA = solar radiation reflected by Earth's atmosphere
Solar down surface = solar radiation hitting Earth's surface
Solar absorption surface = solar radiation absorbed by Earth's surface
Solar reflected surface = solar radiation reflected by Earth's surface
Thermal up surface = heat radiated by Earth's surface to atmosphere
Sensible heat = heat exchanged between Earth's surface and atmosphere due to convection
Thermal outgoing TOA = heat radiated from Earth's atmosphere to space
Greenhouse gas effect = back radiation to the surface from heat retained on Earth's surface by greenhouse gases (CO_2, CH_4, N_2O)
Evaporation = heat conveyed from Earth's surface to atmosphere by evaporation of water

Energy budget values based on IPCC AR5

Earth's Energy Budget Answers



1. Calculating Earth's Energy Budget

Total of all Solar (light) energy down to Earth's surface	185	Total of all solar (light) energy reflected from Earth	24
Total of all heat (thermal) energy to Earth's surface	342	Total of all heat (thermal) energy leaving Earth	502
TOTAL of all energy reaching Earths surface	527	TOTAL of all energy leaving Earth's surface	526

2. Difference in energy IN and energy OUT 1 w/m^2 into Earth's surface

Incoming solar TOA (at the top of the atmosphere) = average solar radiation impinging on top of Earth's atmosphere
Solar reflected TOA = solar radiation reflected by Earth's atmosphere
Solar down surface = solar radiation hitting Earth's surface
Solar absorption surface = solar radiation absorbed by Earth's surface
Solar reflected surface = solar radiation reflected by Earth's surface
Thermal up surface = heat radiated by Earth's surface to atmosphere
Sensible heat = heat exchanged between Earth's surface and atmosphere due to convection
Thermal outgoing TOA = heat radiated from Earth's atmosphere to space
Greenhouse gas effect = back radiation to the surface from heat retained on Earth's surface by greenhouse gases (CO_2, CH_4, N_2O)
Evaporation = heat conveyed from Earth's surface to atmosphere by evaporation of water

Energy budget values based on IPCC AR5