

Earth Science
Energy Unit Exam

Name: _____

Date: _____

Multiple Choice 3 points each. All other questions as marked.

1 During which phase change of water is the **least** energy released into the environment?

- (1) water freezing
- (2) ice melting
- (3) water evaporating
- (4) water vapor condensing

2 A person in New York State worked outdoors in sunlight for several hours on a day in July. Which type of clothing should the person have worn to **reflect** the **most** electromagnetic radiation?

- (1) dark colored with a rough surface
- (2) dark colored with a smooth surface
- (3) light colored with a rough surface
- (4) light colored with a smooth surface

3 Which part of the Sun's electromagnetic spectrum has the **shortest** wavelength?

- (1) radio wave radiation
- (2) infrared radiation
- (3) visible light radiation
- (4) x-ray radiation

4 Energy is transferred from the Sun to Earth mainly by

- (1) molecular collisions
- (2) density currents
- (3) electromagnetic waves
- (4) red shifts

5 Compared to dull and rough rock surfaces, shiny and smooth rock surfaces are most likely to cause sunlight to be

- (1) reflected
- (2) refracted
- (3) scattered
- (4) absorbed

6 Liquid water can store more heat energy than an equal amount of any other naturally occurring substance because liquid water

- (1) covers 71% of Earth's surface
- (2) has its greatest density at 4°C
- (3) has the higher specific heat
- (4) can be changed into a solid or a gas

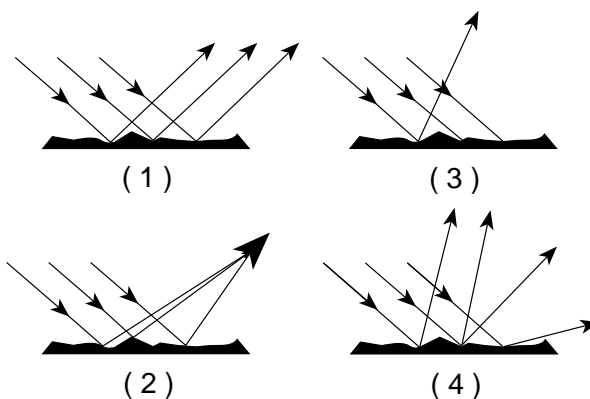
7 Land surfaces of Earth heat more rapidly than water surfaces because

- (1) more energy from the Sun falls on land than on water
- (2) land has a lower specific heat than water
- (3) sunlight penetrates to greater depths in land than in water
- (4) less of Earth's surface is covered by land than by water

8 During which process does heat transfer occur because of density differences?

- (1) conduction
- (2) convection
- (3) radiation
- (4) reflection

9 Which diagram best represents visible light rays after striking a light, smooth surface?



10 Which form of electromagnetic radiation has a wavelength of 1.0×10^{-5} centimeter?

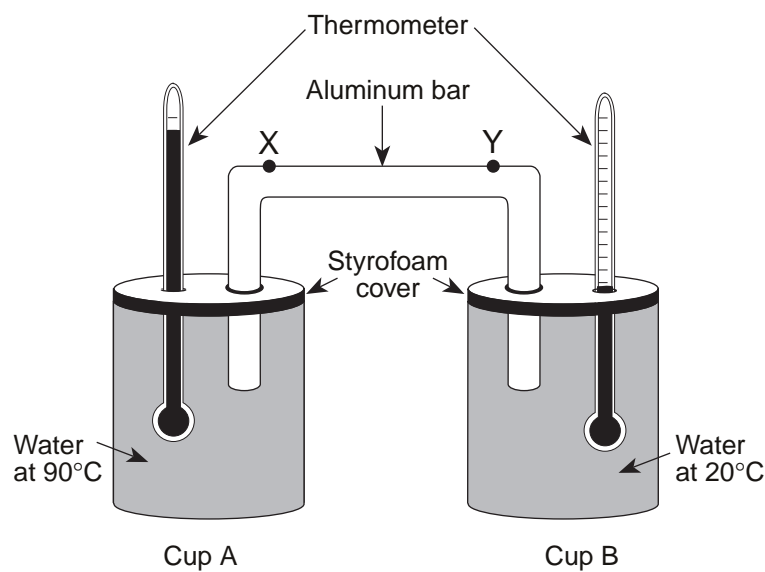
- (1) ultraviolet
- (2) infrared
- (3) radio waves
- (4) microwaves

11 Which phase change requires water to gain **80** calories per gram?

- (1) solid ice melting
- (2) liquid water freezing
- (3) liquid water vaporizing
- (4) water vapor condensing

Base your answers to questions 12 and 13 on the information about a laboratory procedure, diagram, and data table below.

Hot water at 90°C is poured into cup *A*. Cool water at 20°C is poured into cup *B*. Styrofoam covers are placed on the cups. An aluminum bar and a thermometer are placed through holes in each cover. Points *X* and *Y* are locations on the aluminum bar. The data table shows temperature readings taken every minute for 20 minutes.



Minute	Temperature of Water (°C)	
	Cup A	Cup B
0	90	20
1	88	20
2	86	20
3	85	21
4	83	21
5	82	22
6	81	22
7	80	22
8	79	22
9	78	23
10	77	23
11	76	23
12	75	23
13	74	23
14	73	23
15	72	24
16	71	24
17	70	24
18	69	24
19	68	25
20	67	25

- 12 Which change in the experiment would increase the heating rate of the water in cup *B*?
- (1) making the aluminum bar shorter between points *X* and *Y*
 - (2) making the aluminum bar longer between points *X* and *Y*
 - (3) keeping cup *A* covered, but uncovering cup *B*
 - (4) keeping cup *B* covered, but uncovering cup *A*

13. Calculate the rate of temperature change for Cup B during the first ten minutes. Record your answer to the nearest tenth and provide accurate units. Show ALL work. (5pts)

14 Which color of the visible spectrum has the **longest** wavelength?

- (1) violet
- (2) blue
- (3) yellow
- (4) red

15 When 1 gram of liquid water at 0° Celsius freezes to form ice, how many total calories of heat are lost by the water?

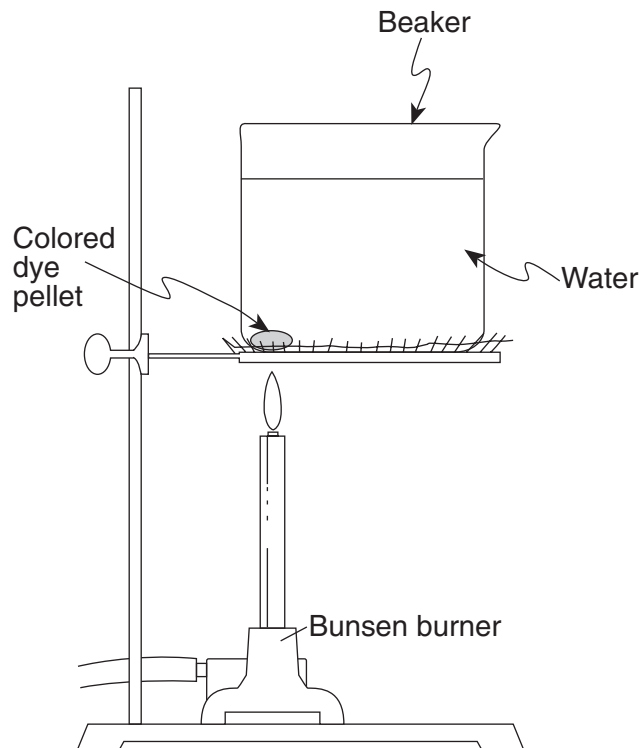
- (1) 1
- (2) 0.5
- (3) 80
- (4) 540

16 Equal volumes of the four samples shown below were placed outside and heated by energy from the Sun's rays for 30 minutes.

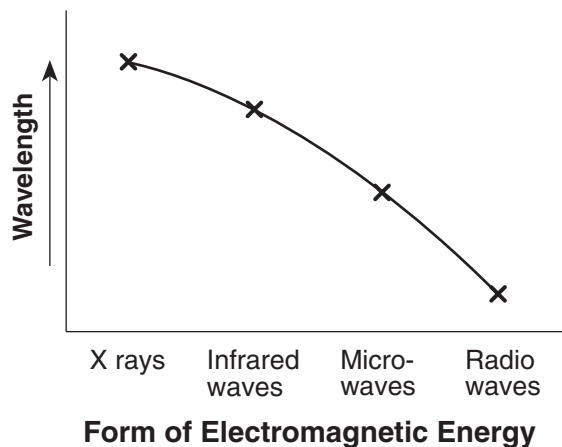


The surface temperature of which sample increased at the **fastest** rate? Prove that your answer is correct by providing specific facts which back up your answer. (5pts)

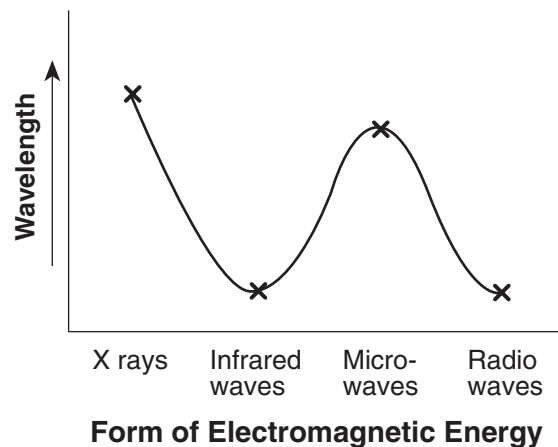
17 The diagram below represents a beaker of water that is being heated. As the colored dye pellet dissolves, the dye will show the movement of water in the beaker. On the diagram, draw arrows in the water to show the direction the colored dye will move when the water is heated as shown. (5 points)



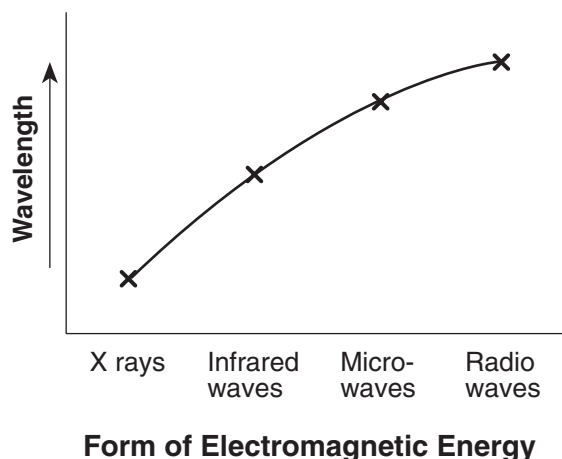
18 Which graph best represents the relative wavelengths of the different forms of electromagnetic energy?



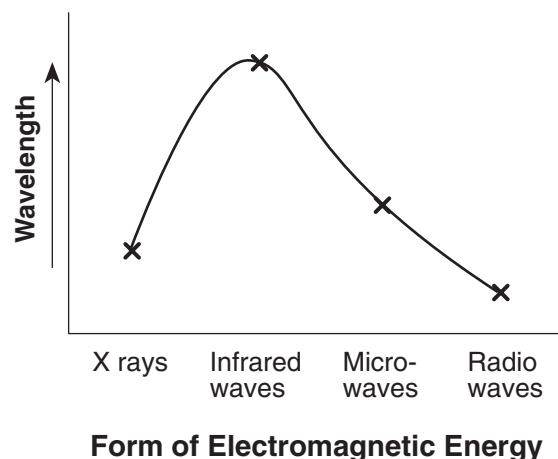
(1)



(3)

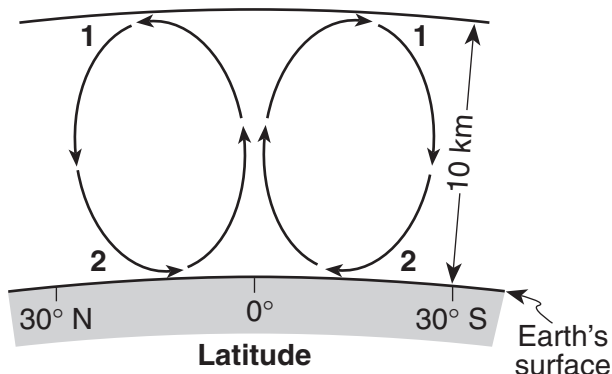


(2)



(4)

Base your answer to question 19 on the cross section below and on your knowledge of Earth science. The cross section shows the general movement of air within a portion of Earth's atmosphere located between 30° N and 30° S latitude. Numbers 1 and 2 represent different locations in the atmosphere.



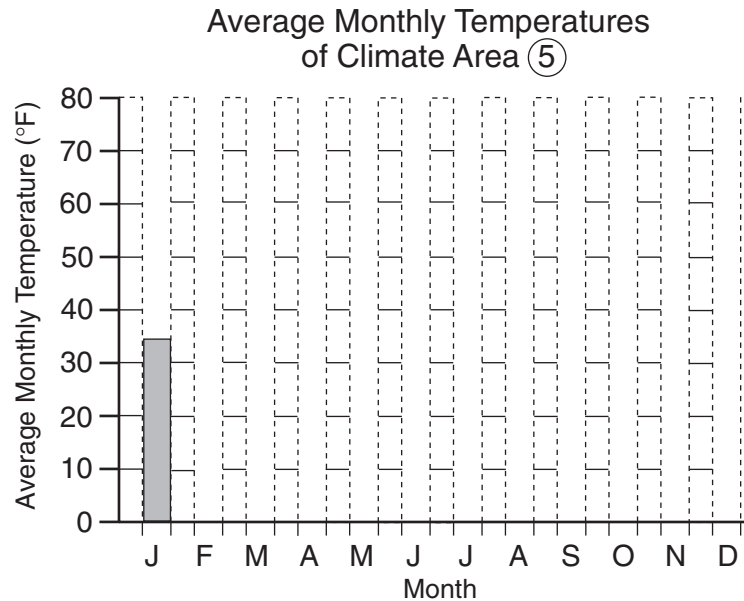
(Not drawn to scale)

- 19 The air movement shown in the cross section is due to the process of
- (1) condensation
 - (2) conduction
 - (3) evaporation
 - (4) convection

- 20 On the grid provided below, construct a bar graph of the average monthly temperatures provided below for climate region 5. January has been completed for you. (10 points)

Average Temperatures for Climate Region 5

Month	°F
January	34
February	36
March	42
April	52
May	61
June	72
July	79
August	74
September	68
October	55
November	49
December	39



- 21 State the relationship that exists between time and temperature from January to July. (8 pts)

- 22 Which object in our solar system has the greatest density?

- (1) Jupiter (3) the Moon
(2) Earth (4) the Sun

- 23 A student incorrectly measured the volume of a mineral sample as 83 cubic centimeters. The actual volume was 72 cubic centimeters. What was the student's approximate percent deviation (percentage of error) to the nearest tenth? Show all work below including formulas. (5pts)

24. In the laboratory experiment on the heating of soil and water, you were asked to express the relationship between the specific heat of an object and its rate of temperature change. Using the data below to assist you, state the relationship that exists between these two variables in a complete sentence. (8 pts)

	Rate of Change	Specific Heat
Soil	high	0.20
Water	low	1.00
