**Astronomy Assessment and TPS Questions:**

**Blackbody Radiation**

*Use the graph at right to answer the next two questions.*

A 8000°K

C

Wavelength

V I B G Y O R

visible range

Energy Output per second

1. Which of the following relationships is possible to infer about objects A and C based on the information provided in the graph at right?
   1. Object A is smaller than Object C.
   2. Object A is larger than Object C.
   3. The objects are the same size.
   4. It is not possible to infer any of these relationships.
2. Which of the two objects (A or C) is at a higher temperature?
   1. Objects A
   2. Objects C
   3. The two objects have the same temperature.
   4. It is not possible to infer this relationship.

V I B G Y O R

visible range

A

B

Energy Output per second

Wavelength

*Use the graph at right to answer the next two questions.*

1. Which of the two objects (A or B) emits light that has a peak emission with the longer wavelength?
   1. Object A
   2. Object B
   3. The objects’ peak emissions are at the same wavelength.
   4. Cannot be determined from the information given.
2. Which of the two objects (A or B) would appear red?
   1. Object A
   2. Object B
   3. Neither object would appear red.
   4. There is insuffiecient information to determine the star’s color.

*Use the graph at right to answer the next three questions.*

visible range

A

D

Wavelength

V I B G Y O R

Energy Output per second

1. Which of the two objects (A or D) is at a higher temperature?
   1. Object A
   2. Object D
   3. The two objects have the same temperature.
   4. It is not possible to infer this relationship.
2. Which of the two objects (A or D) gives off more green light
   1. Object A
   2. Object D
   3. The both give off the same amount of green light
3. Which of the following relationships is possible to infer about stars A and D based on the information provided in the graph?
   1. Object A is smaller than Object D.
   2. Object A is larger than Object D.
   3. The objects are the same size.
   4. It is not possible to infer any of these relationships.

Use the energy output versus wavelength graphs, for objects A-D, shown below to answer the next three questions.

**Object A**

Wavelength

visible range

Energy Output per second

**Object D**

Wavelength

V I B G Y O R

visible range

Energy Output per second

**Object C**

Wavelength

V I B G Y O R

visible range

Energy Output per second

**Object B**

Wavelength

V I B G Y O R

visible range

Energy Output per second

V I B G Y O R

1. Which, if any, of the other objects has the same temperature as object B?
   1. Object A
   2. Object C
   3. Object D
   4. They are all the same temperature.
   5. There is insufficient information to answer this question
2. Which of these objects is the smallest?
   1. Object A
   2. Object B
   3. Object C
   4. Object D
   5. There is insufficient information to answer this question.
3. Which, if any, of the objects could be approximately the same size as object D?
4. Object A
5. Object B
6. Object C
7. More than one of the objects could be the same size as object D.
8. None of the above

Use the energy output versus wavelength graphs, for objects A-D, shown below to answer the next **seven** questions.

**Object D**

Wavelength

V I B G Y O R

visible range

Energy Output per second

**Object C**

Wavelength

V I B G Y O R

visible range

Energy Output per second

V I B G Y O R

Wavelength

**Object B**

visible range

Energy Output per second

**Object A**

Wavelength

visible range

Energy Output per second

V I B G Y O R

1. Which, if any, of the other objects has the same temperature as object A?
2. Object B
3. Object C
4. Object D
5. They are all the same temperature.
6. There is insufficient information to answer this question
7. Which, if any, of the other objects has the same temperature as object B?
8. Object A
9. Object C
10. Object D
11. They are all the same temperature.
12. There is insufficient information to answer this question
13. Which of these objects is the smallest?
14. Object A
15. Object B
16. Object C
17. Object D
18. There is insufficient information to answer this question.
19. Which of these objects is the biggest?
20. Object A
21. Object B
22. Object C
23. Object D
24. There is insufficient information to answer this question.
25. Which, if any, of the objects could be approximately the same size as object D?
    1. Object A
    2. Object B
    3. Object C
    4. More than one of the objects could be the same size as object D.
    5. None of the above.
26. Which, if any, of the objects could be approximately the same size as object D?
27. Object A
28. Object B
29. Object C
30. More than one of the objects could be the same size as object D.
31. **None of the above.**
32. Which of these objects is giving off the largest amount of red light,
33. Object A
34. Object B
35. **Object D**
36. More than one object is giving off the largest amount of red light.
37. None of the above.
38. If you were looking at four Energy Output versus Wavelength graphs that were all the same height, which of the graphs would be from an object giving off the largest amount of Indigo light?
    1. A graph which peaks at IR wavelengths.
    2. A graph which peaks in the red part of the visible spectrum
    3. A graph which peaks at Radio wavelengths.
    4. A graph which peaks at UV wavelengths.
39. If you were looking at four Energy Output versus Wavelength graphs that were all the same height, which of the graphs would be from an object giving off the largest amount of Violet light?
    1. The graph which peaks at IR wavelengths.
    2. The graph which peaks at UV wavelengths.
    3. The graph which peaks in the red part of the visible spectrum
    4. The graph which peaks at Radio wavelengths.
40. If you were looking at four Energy Output versus Wavelength graphs that were all the same height, which of the graphs would be from an object that was largest?
41. The graph which peaks at IR wavelengths.
42. The graph which peaks at UV wavelengths.
43. The graph which peaks in the red part of the visible spectrum
44. The graph which peaks at Radio wavelengths.
45. Which of the graphs below most likely represents the energy output versus wavelength graph for the energy given off by the person sitting next to you taking this test?

## C

X-ray UV VIS IR Radio

**wavelength**

long

short

Energy

X-ray UV VIS IR Radio

**wavelength**

short

Energy

## B

X-ray UV VIS IR Radio

**wavelength**

short

Energy

## A

1. Which of the graphs below most correctly represents the energy output versus wavelength graph for the energy given off by the Sun?

X-ray UV VIS IR Radio

**wavelength**

short

Energy

## B

X-ray UV VIS IR Radio

**wavelength**

short

Energy

## A

## C

X-ray UV VIS IR Radio

**wavelength**

long

short

Energy

1. The three spectral curves shown in the graphs below illustrate the energy output versus wavelength for three unknown stars X, Y, and Z.? Which of the following is the correct ranking for the temperature of the stars, from hottest to coldest.

Wavelength

Energy Output per second

Star X

Energy Output per second

Wavelength

Star Z

Energy Output per second

Wavelength

Star Y

1. Y>X>Z
2. X>Z>Y
3. Z>Y>X
4. X>Y>Z
5. Y>Z>X

The graph at right shows the energy output versus wavelength for Objects A-D. Use this graph to answer the next five questions.

Energy Output per second

V I B G Y O R

visible

range

Wavelength

A

B

C

D

1. Which object has a peak in energy output that occurs at the shortest wavelength?
2. Which object gives off the greatest amount of red light?
3. Which object gives off the greatest amount of UV light?
4. If you had a telescope that was only able to detect radio waves, which of the objects would appear brightest?
5. Which of the following is the correct ranking for the size of Objects A, C and D from largest to smallest.
6. A>C>D
7. D>A=C
8. D>A>C
9. D>C>A
10. None of the above is correct

The graph at right shows the energy output versus wavelength for Objects A-D. Use this graph to answer the next eight questions.

Energy Output per second

V I B G Y O R

visible

range

Wavelength

A

B

C

D

1. Which object has a peak in energy output that occurs at the longest wavelength?
2. Which object gives off the greatest amount of blue light?
3. If you had a telescope that was only able to detect UV light, which of the objects would appear brightest?
4. Which of the following is the correct ranking for the size of Objects A, C and D from largest to smallest.
   1. A>C>D
   2. D>A=C
   3. D>A>C
   4. D>C>A
   5. A=C>D
5. Which object would appear Red?
   1. Object A
   2. Object B
   3. Object C
   4. Object D
   5. None of the objects would appear Red
6. Which object gives off the greatest amount of radio light?
7. Which of the following is the correct ranking for the wavelength of the peak of Objects A - D from shortest to longest?
   1. A=C<B=D
   2. B=D<A=C
   3. A<B<C<D
   4. D<C<B<A
   5. None of the above is correct
8. How many of the Objects A, B, C, and D can be detected by an Infrared telescope?
   1. Only one of the
   2. Two of the objects
   3. Three of the objects
   4. All four of the objects
   5. None of the objects
9. The graph at right shows the blackbody spectra for three different stars. Which of the stars is at the highest temperature?

Star C

Star B

Star A

Wavelength

Energy Output per second

* 1. Star A
  2. Star B
  3. Star C

1. The three spectral curves shown in the graphs below illustrate the energy output versus wavelength for three Stars A, B, and C. Which of the stars has the highest temperature?

V I B G Y O R

Wavelength

Energy Output per second

Star B

Energy Output per second

Wavelength

Star A

Energy Output per second

Wavelength

Star C

V I B G Y O R

V I B G Y O R

1. Star A
2. Star B
3. Star C
4. All three stars have   
   the same temperature.
5. There is insufficient   
   information to determine   
   this.
6. You can determine a star’s temperature from its blackbody curve:
7. by looking at the average height of the curve.
8. by looking at how wide the curve is.
9. by looking at the wavelength that corresponds to the peak of the curve.
10. by looking at the highest energy wavelength included in the curve.



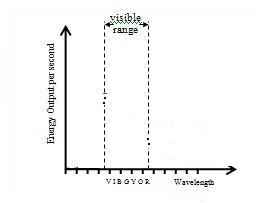
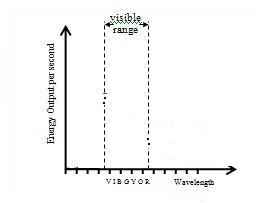
1. Using the image above, which of the two objects (A or C) gives off the greatest amount of blue light?

a. Object A

b. Object C

c. Neither, the two objects both peak outside of the visible range.

1. Is it possible for a white star to give off more red light than a red star?
2. No - white stars do not emit red light.
3. No - red stars emit more red light than any kind of star.
4. Yes.



Star A Star B

1. Using the two images above, which star is colder?
2. Star A

b. Star B

c. They are the same temperature.

d. Not enough information to determine

1. Using the two images above, which star is more luminous?
2. Star A
3. Star B
4. They have the same luminosity.
5. Not enough information to determine
6. Using the two images above, which star is giving off more blue light?
7. Star A
8. Star B
9. They are both giving off the same amount of red light.
10. Not enough information to determine
11. Using the two images above, which star appears blue?
12. Star A
13. Star B
14. They both appear red.
15. They both appear blue.
16. Not enough information to determine
17. Using the two images above, which star is bigger?
18. Star A
19. Star B
20. They are the same size.
21. Not enough information to determine
22. The blackbody curve of Star Harry is taller than the blackbody curve of Star Potter. What does this tell you?
23. Star Harry is hotter than Star Potter.
24. Star Potter is hotter than Star Harry.
25. Star Harry is brighter than Star Potter.
26. Star Harry is both hotter and brighter than star Potter.

visible range

A

D

Wavelength

V I B G Y O R

Energy Output per second

1. Using the image above, which of the two objects (A or D) is bigger?

a. Object A

b. Object D

c. The objects are the same size because their peaks are the same height.

1. Using the image above, which of the two objects (A or D) gives off more light at the **longest** wavelength shown on the graph?

a. Object A

b. Object D

c. They give off equal amounts of the light with the longest wavelength.

1. Use the image above to answer this question. The graphs of objects A and D overlap. **At the point where they intersect**, the objects are giving off the same:

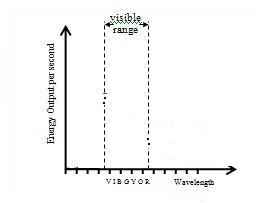
a. wavelength.of light.

b. amount of energy.

c. a and b

d. none of the above

1. The peak of Star M’s blackbody curve is at a higher frequency wavelength than the peak of Star N’s blackbody curve. What does this tell you?
2. Star M is hotter than Star N.
3. Star N is hotter than Star M.
4. Star M is brighter than Star N.
5. Star N is brighter than Star M.



1. Using the image above, which of the following statements is true about this star?
   1. It peaks at a high frequency.
   2. It is very hot.
   3. It has no visible color because we cannot see infrared light.
   4. It looks red.
   5. More than one of the above is correct.
2. If you are standing on the sidewalk at night and you see a car driving towards you, how would you describe the luminosity of its headlights?
3. The luminosity of the car’s headlights is greater when the car is half a mile down the road.
4. The luminosity of the car’s headlights is greater when the car is ten feet in front of you.
5. The luminosity of the car’s headlights would be the same at any location.

V I B G Y O R

visible range

Star A

Star B

Energy Output per second

Wavelength

1. Using the figure above, choose the true statement.
   1. Star B is giving off more red light than Star A.
   2. The stars could be the same color, but Star A is brighter.
   3. Star A is larger than Star B.
   4. The stars could be the same size.
   5. The peak of Star A’s curve is at a longer wavelength than Star B’s peak.