

1 BTU is a unit of energy. It is equal to the energy needed to raise the temperature of one pound of water by one degree Fahrenheit. The specific heat of water is $1 \text{ cal}/(\text{g } ^\circ\text{C})$. One calorie is equal to 4.184 J. One pound is equal to 453.6 g. At the atmospheric pressure, water freezes at 32 degrees Fahrenheit and boils at 212 degrees Fahrenheit. How many Joules is equal to one BTU?

- a** 1 **b** 10 **c** 100 **d** 1000
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2 The magnetic field due to a dipole is inversely proportional to the cube of the distance from the magnetic dipole. Consider a solid ball filled with a matter with a constant magnetic dipole density. For the points outside the ball, the ball can be regarded as a magnetic dipole located at the center of the ball. The magnetic field just outside the ball would be proportional to R^α , where R is the radius of the ball, and α is a constant. What is the value of α ?

- a** 0 **b** 2 **c** 3 **d** -3
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3 The distance of the sun from the earth, is about 400 times the distance of the moon from the earth. Yet, their apparent (angular) diameter as seen from the earth are the same. What is the ratio of the diameter of the sun to the diameter of the moon?

- a** 1 **b** 20 **c** 400 **d** 8000
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4 The diameter of the sun is 100 times the diameter of the earth. What is the ratio of the diameter of the earth to the diameter of the moon?

- a** 1 **b** 4 **c** 20 **d** 400
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5 What is the ratio of the apparent (angular) diameter of the earth to the apparent diameter of the sun, both as seen from the moon?

- a** 1 **b** 4 **c** 20 **d** 400
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6 In the late eighteenth century, definitions were given for the so called metric hour, metric minute, and metric second. A day (the time between two successive noons) is 10 metric hours. A metric hour is 100 metric minutes, and a metric minute is 100 metric second. How many ordinary minutes is a metric hour?

- a** 25 **b** 60 **c** 100 **d** 144
-

7 How many ordinary seconds is one metric minute?

- a** 60 **b** 86.4 **c** 100 **d** 120
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8 The solar wind is a stream of particles ejected from the sun. Assuming that the speed of the particles is not changed when they travel further from the sun, the number of particles per time per area passing through a surface located at a distance R from the sun, is proportional to $R^{-\beta}$, where β is a constant. What is the value of β ?

- a** 1 **b** 2 **c** 3 **d** 0
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9 When the solar wind collides with an object, it exerts a force on the object. This force is the result of the particles of the solar wind giving their momentum to the object, hence is proportional to the number of particles per time, colliding with the object, and of course the momentum of each particle. This force is proportional to r^γ , where r is the size of the object and γ is a constant. What is the value of γ ?

- a** 1 **b** 2 **c** 3 **d** 0
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10 In the solar system, the ratio of the square of the period to the cube of the radius of the orbit (for circular orbits) is constant. The period of Mars is two years. The time it take for light to travel from the sun to the earth is 500 s. When the earth and Mars are nearest to each other how many minutes does it take for light to travel from Mars to the earth?

- a** 5 **b** 13 **c** 18 **d** 25
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11 The speed of sound in air at normal conditions is about 330 m s^{-1} . The speed of light in air is $3 \times 10^8 \text{ m s}^{-1}$. The sound due to a lightning is heard about 6 s after the light is seen. What is the distance of the thunder cloud?

- a** 100 m **b** 2 km **c** 100 km **d** 2000 km
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12 The speed of surface waves of long wavelengths in water is \sqrt{gh} , where g is the gravitational acceleration (equal to 10 m s^{-2}) and h is the depth of water. For $h = 1 \text{ km}$, how much does it take for the wave to travel 1000 km?

- a** 1 s **b** 100 s **c** 10^4 s **d** 10^6 s
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13 Good luck!

English for special purposes, the final exam 1394/03/19

Please mark the correct answers in the answer sheet (the table below) and return it. In case some data is missing, find it.

Name: Mohammad Khorrami

Student number: 0

	a	b	c	d
1				■
2	■			
3			■	
4		■		
5		■		
6				■
7		■		
8		■		
9		■		
10	■			
11		■		
12			■	