

**1** A light year is the distance traveled by light during one year. How many meters is a light year?

- a**  $10^{12}$                       **b**  $10^{16}$                       **c**  $10^{20}$                       **d**  $10^{24}$
- 

**2** Which of the following is the fifth smallest prime?

- a** 1                              **b** 2                              **c** 5                              **d** 11
- 

**3** The rate of oil production in the world is some 100 Million barrels per day. The energy produced by burning oil, is about 40 MJ per kg. What is the power corresponding to burning the world oil production (in terms of J per year)?

- a**  $10^{15}$                       **b**  $10^{20}$                       **c**  $10^{25}$                       **d**  $10^{30}$
- 

**4** The intensity of the sun light at the earth is 1.4 kW per  $m^2$ . The distance of the sun from the earth is 150 million km. Assuming that the sun has a life time of  $10^{10}$  years, and during that time its power remains constant, what is the total amount of energy released by the sun during its life?

- a**  $10^{32}$  J                      **b**  $10^{36}$  J                      **c**  $10^{40}$  J                      **d**  $10^{44}$  J
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**5** A flat table spoon of sugar contains 10 g of sugar. The density of sugar powder is about  $850 \text{ kg m}^{-3}$ . Note that this is different from the density of the sugar (sucrose) crystal; a substantial part in a volume of sugar powder is empty space (air). A metric cup is 0.25 l. How many flat table spoons are equal (in volume) to a metric cup?

- a** 5                              **b** 10                              **c** 20                              **d** 50
-

**6** Consider a neutron star with a mass equal to 5 times the mass of the sun, and the radius of 15 km. What is the average mass density of this neutron star (in terms of  $\text{kg m}^3$ )?

- a**  $10^{18}$                       **b**  $10^{14}$                       **c**  $10^{10}$                       **d**  $10^6$
- 

**7** Naked (healthy) human eye can resolve two points when their angular separation is larger than 1 arc minute. The distance of the moon from the earth is a little larger than one light second. A light second is the distance traveled by light during one second. What is the minimum size (in km) of a feature on the surface of the moon, so that it can be seen like something more than a point?

- a** 3                              **b** 100                              **c** 3000                              **d**  $10^5$
- 

**8** The mass density of the nuclei is essentially constant. What is the ratio of the radius of a uranium nucleus of the mass number 238 to that of a beryllium nucleus of the mass number 9?

- a** 1                              **b** 3                              **c** 10                              **d** 30
- 

**9** What is the mass density of nuclei (in terms of  $\text{kg m}^{-3}$ )?

- a**  $10^6$                               **b**  $10^{12}$                               **c**  $10^{18}$                               **d**  $10^{24}$
- 

**10** The trajectory of a nonrelativistic charged particle moving in a plane, with a magnetic field normal to the plane, is a circle. The radius of the circle is proportional to the product of the mass of the particle and the speed of the particle, and inversely proportional to the charge of the particle. Consider a nonrelativistic electron and a nonrelativistic proton moving in the same magnetic field, with the speed of the electron being 10 times that of the proton. What is the ratio of the radius of the path of the proton to that of the electron?

- a** 20                              **b** 200                              **c** 2000                              **d** 20 000
-

**11** Which of the following are correct?

- a** If a function is differentiable at some point, then it is continuous at that point, but the converse is not necessarily correct.
  - b** If a function is continuous at some point, then it is differentiable at that point, but the converse is not necessarily correct.
  - c** A function is differentiable at some point, if and only if it is continuous at that point.
  - d** Neither of the above is correct.
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**12** A mass is thrown upward at the initial speed of  $15 \text{ m s}^{-1}$ , from a point which is 20 m above the ground. How many seconds does it take for the mass to hit the ground?

- a** 4                      **b** 10                      **c** 20                      **d** 40
- 

**13** Good luck!

**English for special purposes, bunch 1**

**1394/01/17**

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	■			