

1 Denote by d the time interval between two successive noons, and by l the time interval between the sunrise and the next noon. Which of these are constant (in Tehran)?

- a** None **b** only d **c** only l **d** both
-

2 It is said that the power emitted by a supernova, briefly becomes equal to the power emitted by a whole galaxy. Assuming that a galaxy contains 10^{11} stars (consider them similar to the sun, on the average), what should be the distance of a supernova to the earth, in light years, so that its intensity as observed from the earth be equal to that a sun (two suns in the sky, for a short time)?

- a** 0.01 **b** 5 **c** 1000 **d** 5×10^5
-

3 Consider a polyhedron A. Construct the polyhedron B in the following manner. Corresponding to each face of A, the center of that face is a vertex of B. If two faces of A share an edge, then the corresponding vertices of B are connected through an edge. Each vertex of A corresponds to a face of B, with the vertices of that face being those which correspond to the faces of A which share that vertex of A. The polyhedron B constructed like this, is called the dual polyhedron. The dual polyhedron corresponding to a regular tetrahedron is a regular

- a** tetrahedron **b** octahedron **c** icosahedron **d** dodecahedron
-

4 The dual polyhedron corresponding to a regular icosahedron is a regular

- a** tetrahedron **b** octahedron **c** icosahedron **d** dodecahedron
-

5 The Euler characteristic of a polyhedron is equal to the number of its vertices minus the number of its edges, plus the number of its faces. Which is the Euler characteristic of an icosahedron?

- a** 1 **b** 2 **c** 0 **d** (-1)
-

6 A football consists of 12 pentagons and 20 hexagons. Each pentagon is surrounded by 5 hexagons, and each hexagon is between two pentagons, so that each of the two pentagons share one edge with hexagon, and these two edges are parallel to each other. What is the Euler characteristic of the football?

- a** 1 **b** 2 **c** 0 **d** (-1)
-

7 The Debye temperature of a solid is a temperature that if the temperature is not much larger than that, then the specific heat of the solid would be less than the value predicted classically. The Debye temperature is proportional to the speed of sound in the solid. It depends also on the number of atoms per volume, but that dependence is not that important, as the number of atoms per volume does not change drastically in different solids. The square of the speed of sound is proportional to a stress modulus (the harder the material the larger that modulus), and inversely proportional to the mass density. Among copper, iron, lead and diamond, which has the largest Debye temperature?

- a** copper **b** iron **c** lead **d** diamond
-

8 Among copper, iron, lead and diamond, which has the largest mass density?

- a** copper **b** iron **c** lead **d** diamond
-

9 The air pressure at the earth's surface is due to the weight of the air. What is the mass of the earth's atmosphere (in terms of kg)?

- a** 5×10^{12} **b** 5×10^{15} **c** 5×10^{18} **d** 5×10^{21}

10 It is plausible to assume that the difference between the molar entropies of a matter in liquid and gas states, is of the order $R \ln(V_g/V_l)$, where R , V_g , and V_l are the universal constant of gases, the molar volume in the gas state, and the molar volume in the liquid state, respectively. The difference between the molar entropies, times the temperature, is the molar latent heat of the phase change (evaporation). Based on these, what is the molar latent heat of evaporation (in terms of J mol^{-1}), for an evaporation which occurs at 400 K?

- a** 2 **b** 200 **c** 2×10^4 **d** 2×10^6
-

11 If the molar mass of the substance of the above problem is 20 g mol^{-1} , what is the latent heat per mass (in terms of J kg^{-1})?

- a** 1 **b** 100 **c** 10^4 **d** 10^6
-

12 A few hundred million years ago, the land of the earth consisted mostly of a single supercontinent, the Pangaea. Then a rift began to appear between what are now Eurasia and North America. The rift has widened since then, and it is continuing to widen. That rift is now called the Atlantic ocean. Assuming a constant rate, how much the distance between Europe and North is increased per year?

- a** $1 \mu\text{m}$ **b** 0.1 mm **c** 1 cm **d** 1 m
-

13 Good luck!

English for special purposes, bunch 2

1394/02/16

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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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12	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>