1 The electric charges of the proton and the electron are the same (apart from the sign). The mass of the proton is 2000 times the mass of the electron. In the same electromagnetic fields, what is the ratio of the force on the proton to that on the electron?

a 1   **b** 2000   **c** 4×10^6 **d** 5×10^{-4}

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2 In the previous problem, what is the ratio of the acceleration of the proton to that of the electron?

a 1   **b** 2000   **c** 4×10^6 **d** 5×10^{-4}

---

3 In football, the distance of the penalty spot from the goal is 12 yards. Each yard is 3 feet, each foot is 12 inches, and each inch is $25.4\,\mathrm{mm}$. What is the distance of the penalty spot from the goal, in terms of meters?

a 1   **b** 11   **c** 12   **d** 16.5

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4 Which of the following is correct?

a The sky is fixed relative to us

b Only the stars (except the sun) are fixed relative to us

c The sky is rotating relative to us, but all of its objects look fixed relative to themselves

d The sky is rotating relative to us, and only the stars (except the sun) look fixed relative to each other

---

5 A horsepower is $750\,\mathrm{W}$. The power of a car is 100 horsepowers, and the energy of burning fuel is $40\,\mathrm{M\,J\,lit}^{-1}$. At a speed of $100\,\mathrm{km\,h}^{-1}$, how much fuel per distance is needed (assuming no energy loss)?

a $70\,\mathrm{m\,lit}\,(\mathrm{km})^{-1}$ **b** $7\,\mathrm{lit}\,(\mathrm{km})^{-1}$ **c** $700\,\mathrm{lit}\,(\mathrm{km})^{-1}$

d $70\,\mathrm{m}^3\,(\mathrm{km})^{-1}$

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6 Kepler's third law states that for planets' motion, the period squared is proportional to the semi-major axis-cubed. The perihelion and the aphelion of Jupiter are 4.95 and 5.46 astronomical units, respectively, where an astronomical unit is the average distance of the earth from the sun. how many years is the period of Jupiter?

a 5   **b** 12   **c** 25   **d** 50

7 When a lake freezes, it does so from the surface. That is, there is a surface layer of ice, below which is liquid water. Denoting the densities of liquid water and ice by ρ_w and ρ_i, respectively, which is correct?

a $0 = \rho_i < \rho_w$ **b** $0 \neq \rho_i < \rho_w$ **c** $\rho_i = \rho_w$ **d** $\rho_i > \rho_w$

---

8 When the force applied to a particle is central, the angular momentum of the particle is conserved. The angular momentum is a vector which is perpendicular to both the position vector and the velocity vector. When the force is central,

a the particle moves on a fixed line which is parallel to the angular momentum

b the particle moves on a fixed line which is perpendicular to the angular momentum

c the particle moves on a fixed plane which is parallel to the angular momentum

d the particle moves on a fixed plane which is perpendicular to the angular momentum

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9 The body mass index (BMI) of a person is defined as the ratio of his (her) mass in k g, divided by the square of his (her) height in m. For someone of the mass $45\,\mathrm{kg}$ and the height $170\,\mathrm{cm}$, what is the value of BMI?

a 3.95   **b** 15.6   **c** 26.5   **d** 1190

---

10 The magnitude of a star is defined as $2.5 \log(I_0/I)$, where I is the intensity of the star, I_0 is some constant, and the logarithm is in the base 10 *not the natural logarithm*. The magnitudes of two stars are 1 and 11. What is the ratio of their intensities?

a 5   **b** 10   **c** 25   **d** 10^4

---

11 A particles is at rest at $t = 0$. The acceleration of the particle is proportional to t, where t is the time. What is the ratio of the speed of the particle at the time $(2\,t)$, to the speed of the particle at the time t?

a 1   **b** 2   **c** 4   **d** 8

---

12 In the previous problem, What is the ratio of the distance the particle travels between 0 and $(2\,t)$, to the distance the particle travels between 0 and t?

a 1   **b** 2   **c** 4   **d** 8

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13 Good luck!

English for special purposes, bunch 3   1398/03/01

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				■