HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY
ADVANCED PROGRAMS - PHYSICS HOMEWORK

1. MECHANICS

1.1 PRELIMINARIES

Name:..... Date of birth:.....

Class:..... Student ID:.....

Grade table

Question:	1	2	3	4	5	6	7	8	9	10	11	12	Total
Points:	4	2	3	3	2	3	4	3	4	5	5	5	43
Score:													

1. Mass, length and time are all SI base quantities. State four other SI base quantities. [4]

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2. .....

3. .....

4. .....

2. The force F between two point charges is given by $F = Q_1Q_2/4\pi\varepsilon r^2$, where Q_1 and Q_2 are the charges, r is the distance between the charges, and ε is a constant that depends on the medium between the charges. Determine the base units of ε. [2]

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3. Add $(9.2 \times 10^3\,\text{s}) + (8.3 \times 10^4\,\text{s}) + (0.008 \times 10^6\,\text{s})$, taking into account significant figures. [3]

4. Multiply $3.079 \times 10^2\,\text{m}$ by $0.068 \times 10^{-1}\,\text{m}$, taking into account significant figures. [3]

5. What, approximately, is the percent uncertainty for a measurement given as $1.57\,\text{m}^2$? [2]

6. What, roughly, is the percent uncertainty in the volume of a spherical beach ball of radius $r = 0.84 \pm 0.04\,\text{m}$? [3]

7. What is the area, and its approximate uncertainty, of a circle of radius $3.1 \times 10^4\,\text{cm}$? [4]

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8. Express the following sum with the correct number of significant figures: [3]

$$1.80\,\text{m} + 142.5\,\text{cm} + 5.34 \times 10^5\,\mu\text{m}$$

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9. A standard baseball has a circumference of approximately 23 cm. If a baseball had the same mass per unit volume (see Tables in Section $1-5$, Giancoli) as a neutron or a proton, about what would its mass be? [4]

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10. Grains of fine California beach sand are approximately spheres with an average radius of 50 m and are made of silicon dioxide, which has a density of $2600\,\text{kg}\,\text{m}^{-3}$. What mass of sand grains would have a total surface area (the total area of all the individual spheres) equal to the surface area of a cube 1.00 m on an edge? [5]

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11. During heavy rain, a section of a mountainside measuring 2.5 km horizontally, 0.80 km up along the slope, and 2.0 m deep slips into a valley in a mud slide. Assume that the mud ends up uniformly distributed over a surface area of the valley measuring $0.40\,\text{km} \times 0.40\,\text{km}$ and that mud has a density of $1900\,\text{kg}\,\text{m}^{-3}$. What is the mass of the mud sitting above a $4.0\,\text{m}^2$ area of the valley floor? [5]

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12. A vertical container with base area measuring 14.0 cm by 17.0 cm is being filled with identical pieces of candy, each with a volume of $50.0\,\text{mm}^3$ and a mass of 0.0200 g. Assume that the volume of the empty spaces between the candies is negligible. If the height of the candies in the container increases at the rate of $0.250\,\text{cm}\,\text{s}^{-1}$, at what rate (kilograms per minute) does the mass of the candies in the container increase? [5]

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