

系所組別： 口腔醫學研究所丙組

考試科目： 普通物理學

考試日期：0226，節次：3

1. Describe and explain: (a) Blackbody radiation, (b) Curie temperature, (c) Ferromagnetism, (d) Snell's law, (e) Microwaves. (20%)
2. Describe and explain the distinction between heat and internal energy. (10%)
3. A block of ice of mass 2.0 kg has an initial temperature of -30°C . The specific heat of ice is $c = 2040 \text{ Jkg}^{-1}\text{K}^{-1}$, the latent heat of fusion of water is $L_f = 3.34 \times 10^5 \text{ Jkg}^{-1}$, and the latent heat of vaporization of water is $L_v = 2.26 \times 10^6 \text{ Jkg}^{-1}$. (a) How much heat is required to raise the temperature of the block ice to 0°C ? (b) How much heat is required to completely melt the block ice? (10%)

4. One nuclear reaction that could be used in a fusion reactor is: ${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0\text{n}$
The mass of each nucleus and neutron (in atomic mass units) is:

Nucleus	Symbol	Mass
Deuterium	${}^2_1\text{H}$	2.014 u
tritium	${}^3_1\text{H}$	3.016 u
helium	${}^4_2\text{He}$	4.003 u
neutron	${}^1_0\text{n}$	1.009 u

- (a) What is the decrease in mass in this reaction? (b) What happen to this lost mass? (c) How much mass (in Kg) is needed to produce $1.0 \times 10^{10} \text{ J}$ of energy? (10%)
5. A hydrogen atom consists of one proton and one electron, usually about $5.3 \times 10^{-11} \text{ m}$ apart. (a) What is the magnitude of the gravitational force between the proton and electron, (b) What is the magnitude of the electric between them? (10%)

particle	mass (kg)	charge (C)
proton	1.67×10^{-27}	1.6×10^{-19}
electron	9.11×10^{-31}	-1.6×10^{-19}
6. A converging lens with a focal length of 20 cm is used to form an image of object that is 50 cm away from the lens. (a) Draw a ray diagram showing where the image will form. (b) What is the power of the lens, (c) What is the initial vergence of the light? (d) Why is the initial vergence negative? (e) What is the final vergence of the light? (f) Where is the image? How far from the lens is it? (g) Is the image real or virtual? (15%)

(背面仍有題目,請繼續作答)

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7. An ideal gas expands to twice its volume the following condition: (a) isothermal; (b) adiabatic; (c) isobaric. Sketch each process on a PV diagram. In which case is the final temperature the greatest? (15%)
8. The sun's radiation causes an iceberg to melt and thereby increase its entropy. The radiation also helps a plant to grow, thereby decreasing its entropy. Is there a contradiction here? (10%)