I. 選擇題: 共 30 題，每題 2 分 (4 選 1: 答錯不倒扣)

1. Vector A has a magnitude of 6 units and points due east. Vector B points due south. What is the magnitude of B, if the vector A+B points $60^0$ south of east? (a) 5.2 units (b) 6 units (c) 10.4 units (d) 12 units

2. A car starts at rest, and accelerate at 5 m/s$^2$ along a straight high way. When it reaches a velocity of 90 km/hr, what is the distance the car moves? (a) 5 m (b) 12.5 m (c) 62.5 m (d) 125m

3. A rock a dropping from the top of the building. The height of the building is 548.8 m. Find the end speed when it hit the ground. (a) 73.3 m/s (b) 103.7 m/s (c) 51.8m/s (d) 56 m/s.

4. A hockey puck of mass 400 g is shot across the ice ring with an initial speed of 50 m/s. When the puck reaches the goal 25.0 m away, it is moving at speed of 49 m/s. What is the work done on the puck by the friction force? (a) -9.9 J (b) -19.8 J (c) -39.6 J (d) -79.2J

5. If a spring was cut in half, the spring constant of either half is now many times that of the original spring? (a)1/2 (b) 1 (c) 2 (3)4

6. Two partials A and B of masses 2 g and 1 g respectively move in opposite directions. The initial velocity of A is 40 m/s towards the right, while that of B is 20 m/s towards the left. They collide head on. After the collision, the velocity of A becomes 10 m/s toward the right. What would be the velocity of particle B? (a) 10 m/s towards the right (b) 20 m/s towards the right (c) 0 (d) 10 m/s towards left

7. (a)Figures below show four arrangements in which each painting is suspended from a wall with two identical lengths of wire. The angles between the wires and the horizontal side of the painting in figure (b) and (c) are the same. Rank the four arrangements according to the tension in the wires, largest first. (a) a>b=c>d (b) a<b=c<d (c) a > c>d>b (d) a<c<d<b



(a)　　　(b)　　　(c)　　　(d)

8. When a vector is multiplied by a non-unity positive scalar the result is (a) a scalar (b) a vector with same magnitude point to the same direction (c) a vector with different magnitude point to the same direction (d) a vector with different magnitude point to the opposite direction.

9. In 2 minutes, a ski lift raises 4 skiers at constant speed to a height of 120 m. The average mass of each skier is 50 kg. What is the average power provided by the tension in the cable pulling the lift? (a) 500 W (b) 2000 W (c) 30000 W (d) 120000 W

（背面仍有題目，請繼續作答）

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10. If you tossed an object either up or down and could somehow eliminate the effect of air, the object acceleration of the object depends mostly on (a) its mass (b) its density (c) its shape (d) none of the above

11. A mass M is split into 2 parts, m and M-m, which are then separated by a certain distance. What ratio of m/M maximized the gravitational force between the 2 parts? (a) 0.75 (b) 0.5 (c) 0.25 (d) 0.1

12. Which of the following is/are vectors? (A) momentum (B) kinetic energy (C) potential energy difference: (a) A only (b) B only (c) A and C (d) B and C

13. A hair dryer has a resistance of 10 $\Omega$ and is plug into a 110-V outlet. What is the current in the hair dryer? (1) 1.1 (b) 5.5 (c) 11 (d) 1100 A

14. The de Broglie wavelength of an $\alpha$ -particle (a) $4.53 *10^{-14}$ (b) $4.53* 10^{-15}$ (c) $4.53*10^{-16}$ (d) $4.53* 10^{-17}$

15. Calculate the wavelength of electromagnetic waves needed to excite a hydrogen atom from the 1s into 2s state (a) $1.22 *10^{-5}$ (b) $1.22 * 10^{-6}$ (c) $1.22*10^{-7}$ (d) $1.22* 10^{-8}$

16. An elevator with mass 2500 kg rise with an acceleration of 0.5 m/s$^2$. What is the tension in the supporting cable? (a) 1250 N (b) 18600 N (c) 19600 (d) 20600 N

17. A ski tow is to be operated on a $37^0$ slope 300 m long. The slope is to move at 12km/hr and power must be provided for 80 riders at one time, with average mass per rides of 70 kg. estimated the horsepower required to operate the tow (a) 36 hp (2) 72 hp (c) 108 hp (d) 148 hp

18. The magnitude of mass (kg) for Uranium atom is in the order of (a) $10^{-21}$ (b) $10^{-30}$ (c) $10^{-24}$ (d) $10^{-27}$

19. A child weighing 400N sits on one end of a seesaw that is 3.0 m long and is pivoted 1.4 m from the child. If another child sitting at the opposite end just balances, what is his weight? (a) 300N (b)350N (c)187N (d)857N

20. The resistance of resistor A is twice the resistance of resistor B: The two are connected in parallel and a potential difference is maintained across the combination. Then (a) the current through resistor A is twice that through resistor B (b) the current through resistor A is half that through resistor B (c) the potential difference across resistor A is twice that across resistor B (d) the potential difference across resistor A is half that across resistor B

21. Two 110 V light bulbs, one 25W and the other 100 W, are connected in series to a 110V power source. Then (a) the current in the 100 W bulb is greater than that in the 25 W bulb (b) the current in the 100 W is less than that in the 25W bulb (c) both bulb will light with equal brightness (d) none of the above.

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22. In a purely capacitive AC circuit, the current (a) leads the voltage by 1/4 of a cycle (b) leads the voltage by 1/2 of a cycle (c) lags the voltage by 1/4 of a cycle (d) lags the voltage by 1/2 of a cycle

23. A nichrome wire is 1 m long and has a 1 mm$^2$ cross-sectional area. When connected to a potential difference of 2 V, a current of 4A exists in the wire. The resistivity of the nichrome is (a) $10^{-7}\Omega \cdot m$ (b) $2 \times 10^{-7}\Omega \cdot m$ (c) $4 \times 10^{-7}\Omega \cdot m$ (d) $5 \times 10^{-7}\Omega \cdot m$

24. For an ohmic resistor, resistance is the proportionality constant for (a) potential difference and electric field (b) current and electric field (c) potential difference and current (d) current and cross-sectional area

25. If the cross-sectional area of a conductor is double, the resistance (a) increases by a factor of 4 (b) increases by a factor 2 (c) decrease by a factor of 1/2 (d) decreases by a factor of 1/4

26. The electric field between parallel plates connected to a 100-V power supply is 2 kV/m. How far apart are the plates? (a) 0.2 cm (b) 2.0 cm (c) 5 cm (d) 0.5 cm

27. What is the smallest distance that it could possible resolve for an electron microscope operating at 50 kV (a) $3 \times 10^{-11}$ (b) $5.5 \times 10^{-11}$ (c) $3 \times 10^{-12}$ (d) $5.5 \times 10^{-12}$ m

28. A monochromatic light beam of frequency $6 \times 10^{14}$ Hz crosses from air into a transparent material where its wavelength is measured to be 300 nm. What is the index of refraction of the material? (a) 1.25 (b) 1.35 (c) 1.5 (d) 1.61

29. A 1000-kg truck is hauling a 100-kg trailer, to which it is connected by a spring. The spring constant is 1500N/m. The truck accelerates with an acceleration of 0.3 m/s$^2$. By how much does the spring stretch? (a) 0.01 m (b) 0.02 m (c) 0.1 m (d) 0.2 m.

30. An object is placed 4 cm in front of a concave mirror that has a 12-cm focal length. The object is 4 cm high. Find the image height (a) 3 cm (b) 6 cm (c) 8 cm (d) 12 cm.

（背面仍有題目,請繼續作答）

Part II: 計算題: 共 40 分

1. John and Harry sit in swings, facing each other, and pull on opposing ends of a horizontal rope, thus causing john's swing to be displaced $45^0$ and Harry's $30^0$. If John weights 40 kg, how much does Harry weight? (8 分)

2. Two lenses, each of focal length 4.0 cm, are mounted 70 cm apart, and an arrow 1.0 cm high is located 2.0 cm from the first lens. Where is the second image formed, and how high is it? (8 分)

3. What is the capacitance in farads of a capacitor made by pasting sheets of tinfoil to opposite faces of a sheet of paraffin paper? The area of the paper between the foil is 625 $cm^2$, the thickness of the paper is 0.0025 cm, and its dielectric constant is 2.6. (8 分)

4. A wire 1 m long and 1 $cm^2$ in cross section is stretched 2 cm by a force of 10000N. What are (a) the stretching stress (b) the stretching strain (c) Young's modulus of the material (6 分)

5. An iron hoop of radius 1.5 ft, weighting 4.0 lb, starts from rest and rolls downhill, acquiring a speed of 12 ft/sec. Find (a) its final translational kinetic energy, (b) its final rotational kinetic energy (c) the height of the hill. (d) What would its final velocity have been if it had slid downhill without friction? (10 分)