1) 一質量為10 kg 的大木塊靜置於一光滑之水平地面，將一質量為4 kg 的小木塊置於大木塊上，假設兩木塊間的靜摩擦係數為0.5，今以F 的力水平推大木塊，若欲使大小木塊間不產生滑動，則大木塊最大的加速度可為若干？（g 為重力加速度）

   (a) 0.1 g   (b) 0.2 g   (c) 0.5 g   (D) g

2）一輛汽車在平坦的路面上高速行駛，當汽車突然左轉彎，下列敘述何者最可能較為正確？

  (a)右車輪可能懸空，乘客可能往車右方擠   (b)左車輪可能懸空，乘客可能往車左方擠

  (c)右車輪可能懸空，乘客可能往車左方擠   (d)可能懸空，乘客可能往車右方擠

3) 一小船引擎功率為1000 瓦，今若使用此功率航行於一小河，以每小時36 公里的速度等速行駛，則船在河中所遭遇的阻力為多少牛頓？

  (a) 400   (b) 300   (c) 200   (d) 100

4) 一個定滑輪以繩索固定在天花板上，另以一繩索跨過定滑輪，繩兩端分別連著質量為2 m 及6 m 的物體，若令物體自由運動。假設繩子與滑輪間沒有能量損耗，且忽略滑輪與繩子的質量，則在物體運動過程中，天花板所承受的拉力為何？

  (a) 4 mg   (b) 6 mg   (c) 8 mg   (d) 10 mg

5) 兩個一模一樣的導體球，質心距離為1 公尺，各自帶淨電荷2 庫倫與4 庫倫，將其互相接觸後再放回原處，請問接觸後，兩導體球間的庫倫力變為原來的幾倍？

  (a) 81 / 64   (b) 64 / 81   (c) 8 / 9   (d) 9 / 8

6) 下列有關熱量的敘述，何者正確？

  (a)熱量由高溫物體流向低溫   (b)物體熱量由能量多的物體流向能量少的物體

  (c)熱量由比熱大的物體流向比熱小的物體   (d) 熱量由位置高的物體流向位置低的物體

7) 一密度為0.6 $g/cm3$、體積為10 $cm3$ 的木塊浮在水面上，水的密度為1 $g/cm3$，則木塊露出水面的體積有多少？   (a) 6 cm^3 (b) 4 cm^3 (c) 2 cm^3 (d) 3 cm^3

8) 1 庫倫的電量相當於多少個電子的電量？

  (a) 6.02×10^{23} (b) 6.25×10^{18} (c) 1.6×10^{-19} (d) 1.6×10^{23}

9）一電池與四個電燈泡連接使用，下列那一種接法可讓電池電量維持最久？

  (a)三個燈泡並聯後與另一燈泡串聯   (b) 四個燈泡並聯在一起

  (c)兩個燈泡並聯後與另外兩個燈泡串聯   (d)四個燈泡串聯在一起

10) 四個20Ω的電阻並聯後，連接一個20V 的電池，則下列敘述何者正確？

  (a) 通過每一個電阻的電流為4A   (b)電池流出的總電流為4A

  (c) 該電路的等效電阻為80Ω   (d)電阻兩端的電位降為5V

11) 家電用的電磁爐通常是根據法拉第的電磁感應原理所製造。利用磁場使置於爐面上的鍋子出現感應電流，再透過電流的熱效應，使鍋子產生高溫以烹煮食物。下列有關此種電磁爐與所用鍋子的敘述，何者正確？

  (a) 電磁爐所用的鍋子必須是電的絕緣體   (b) 電磁爐所用的鍋子必須是熱的絕緣體

  (c) 電磁爐使用的是會隨時間變化的磁場   (d) 鍋子中出現的感應電流必為直流電

12) An object initially at rest explodes in two fragments of masses 4.3 kg and 1.6 kg that move in diametrically opposite directions. If the speed of the first fragment is 8.4 m/s find the internal energy of the explosion.

  (a) 560 J   (b) 210J   (c) 560 kJ   (d) 210 kJ

13) An object attached to a spring is pulled across a frictionless surface. If the spring constant is $45 \, \text{N/m}$ and the spring is stretched by $0.88 \, \text{m}$ when the object is accelerating at $2.0 \, \text{m/s}^2$, what is the mass of the object?

  (a) 22 kg   (b) 26 kg   (c) 20 kg   (d) 17 kg

14) If you jumped out of a plane, you would begin speeding up as you fall downward. Eventually, due to wind resistance, your velocity would become constant with time. After this occurs, the magnitude of the force of wind resistance is

  (a) is much smaller than the force of gravity acting on you.

  (b) is slightly smaller than the force of gravity acting on you.

  (c) is greater than the force of gravity acting on you.

 (d) equal to the force of gravity acting on you.

15) A ball is tossed vertically upward. When it reaches its highest point (before falling back downward),

    (a) the velocity is zero, the acceleration is directed downward, and the force of gravity acting on the ball is directed downward.

    (b) the velocity is zero, the acceleration is zero, and the force of gravity acting on the ball is directed downward.

    (c) the velocity is zero, the acceleration is zero, and the force of gravity acting on the ball is zero.

    (d) None of the above

16) Three balls, with masses of M, $1.5M$, and $2M$ are fastened to a massless rod of length $2L$ as shown. The rotational inertia about the left end of the rod is:
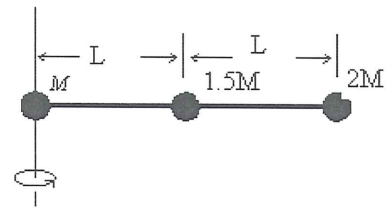
    (a) $ML^2/2$ (b) $9.5ML^2$ (c) $3.5ML^2$ (d) $5.5ML^2/2$

17) If the total energy of a harmonic oscillator is reduced by 1/3, what is the change in the amplitude of the oscillations?

    (a) $\sqrt{3}$ (b) 1/3   (c) 3   (d) $\sqrt{1/3}$

18) During an adiabatic process a 150 J of work is done on the object and its temperature decreases by 3 K. During another process a 30 J of work is done and its temperature decreases by 6 K. Its heat capacity for the second process is:

    (a) 15 J/K   (b) 20 J/K   (c) 100 J/K   (d) 35 J/K

19) The diagram shows three isotherms for an ideal gas, with T_3-T_2 the same as T_2-T_1. It also shows five thermodynamic processes carried out on the gas. Rank the processes in order change in the internal energy of the gas, greatest to least.
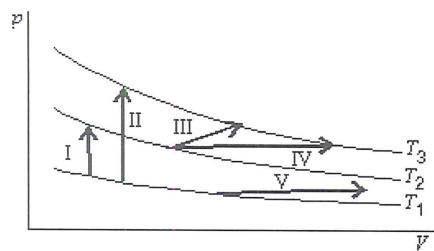
    (a) I, II, III, IV, V   (b) V, then I, III, and IV tied, then II

    (c) II, then I, III, and IV tied, then V   (d) V, I, then I, III, and IV tied, then II

20) The diagrams shows a PV diagram for 9.5 g of oxygen gas in a sealed container. The temperature of state 1 is 80℃. What are the temperatures T3, and T4?

    (a) 260℃ and 790℃   (b) -8.2℃ and 520℃   (c) 60℃ and 180℃   (d) 40℃ and 120℃
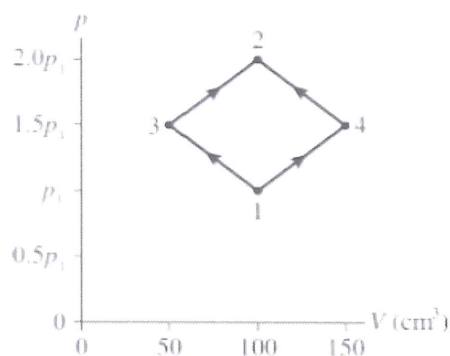
21) Which one of the statements is not a similarity between Coulomb's law and Newton's law of gravitation?

    (a) In both laws, the force is inversely proportional to the square of the distance between two particles.

    (b) In both laws, the force decreases with increasing distance between the two particles.

    (c) In both laws, the force is always one of attraction between the two particles.

    (d) In both laws, the force is proportional to the product of an intrinsic property of each of the two particles.

22) Consider the electric field lines shown in the drawing. Which of the following statements correctly describes this situation?

    (a) The electric field is due to a positively charged particle.

    (b) The electric field is due to a negatively charged particle.

    (c) The electric field is due to a positively charged particle and a negatively charged particle.

    (d)The electric field is due to particles that are both charged either positively or negatively.
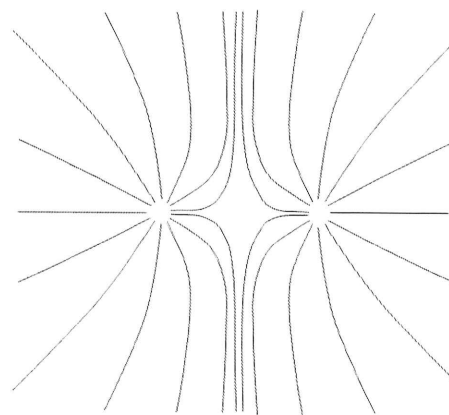
23) A positively charged object is located to the left of a negatively charged object as shown. Electric field lines are shown connecting the two objects. The five points on the electric field lines are labeled A, B, C and D. At which one of these points would a test charge experience the smallest force?

    (a) A   (b) B

    (c) C   (d) D
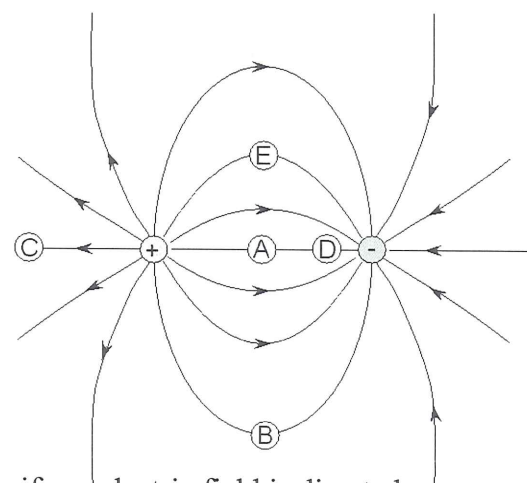
24) An electron traveling horizontally to the right enters a region where a uniform electric field is directed downward. What is the direction of the force exerted on the electron once it has entered the field?

    (a) upward   (b) downward   (c) to the right   (d) to the left

25) What is capacitance?

    (a) the amount of charge on a capacitor

    (b) the amount of current flowing into or out of a capacitor

    (c) the maximum amount of charge a capacitor can hold

    (d) the amount of charge needed to produce a certain potential difference across a capacitor