2020−2021 AUT Admission Test
Physics (Sample)

< Multiple choice Questions > There is only one correct answer per each question. Mark your answer choice on the OMR answer sheet. For each correct answer, you will get 4 points. No penalty point is applied to an incorrect answer.

1. Bob throws a ball straight up with the initial speed of 20 m/s. Jim, at the same time, drops another ball from the roof of a building at the height of 10 m. How long does it take for the two balls reach the same height? Assume g=10 m/s^2.

① 0.5 s   ② 0.67 s   ③ 1 s   ④ 1.4 s   ⑤ 3.9 s

2. An object of mass 4 kg is rotating in a circular path on a horizontal frictionless surface, attached to the end of a 0.8 m-long string. If the maximum tension the string can withstand is 20 N, what is the maximum speed of the object without breaking the string?

① 2 m/s   ② 3 m/s   ③ 4 m/s   ④ 8 m/s   ⑤ 9 m/s

3. A block of mass 2 kg is sliding along a horizontal frictionless surface with speed of 5 m/s. It hits a spring with the spring constant of 1800 N/m. What is the speed of the block when it compresses the spring by 10 cm?
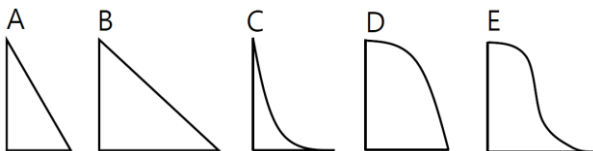
① 0.6 m/s   ② 1.2 m/s   ③ 2.4 m/s   ④ 4 m/s   ⑤ 4.8 m/s

4. A pendulum of length L with a bob of mass m is oscillating with small amplitude. Which of the following changes would double its period?

① doubling the amplitude of the swing   ② doubling the length L

③ quadrupling the length L   ④ doubling the mass m   ⑤ quadrupling the mass m

5. A wooden block of mass M is moving at speed V in a straight line. How fast would the bullet of mass m need to travel to stop the block (assuming that the bullet became embedded inside)?

① $\frac{mV}{m+M}$ ② $\frac{MV}{m+M}$ ③ $\frac{mV}{M}$ ④ $\frac{MV}{m}$ ⑤ $\frac{(m+M)V}{m}$

6. On which of the five slopes shown below does the ball roll down with monotonically decreasing acceleration along the path?
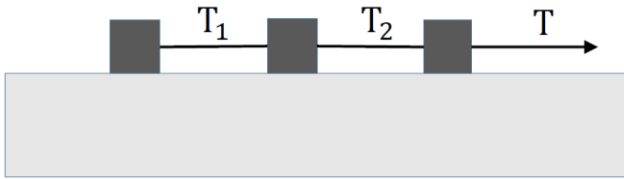

① A   ② B   ③ C   ④ D   ⑤ E

7. Three identical blocks are pulled on a horizontal frictionless surface as shown below. If the tension T on the right end is 30 N, what is the tension in the other ropes?


① $T_1 = 10$ N, $T_2 = 10$ N

② $T_1 = 15$ N, $T_2 = 15$ N

③ $T_1 = 10$ N, $T_2 = 20$ N

④ $T_1 = 20$ N, $T_2 = 10$ N

⑤ $T_1 = 30$ N, $T_2 = 30$ N

8. At which of the indicated positions does the planet in an elliptical orbit has the greatest speed or the greatest angular momentum?
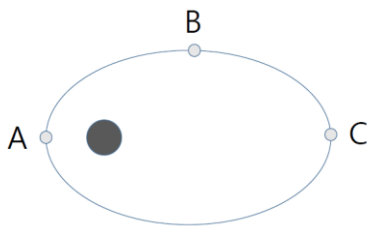
	Speed	Angular momentum
①	A	A
②	C	B
③	A	C
④	Same	C
⑤	A	Same

9. A certain spring stretches 4 cm when a load of 10 N is suspended from it. How much will the spring stretch if an identical spring also supports the load as shown below?
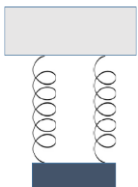
① 1 cm ② 2 cm ③ 4 cm ④ 5 cm ⑤ 8 cm

10. An ambulance is moving at a constant velocity and emits a sound of frequency 1000 Hz. A person inside a car moving in the opposite direction with the same speed as the ambulance hears a frequency of 800 Hz. What is the ratio of the speed of the ambulance divided by the speed of sound?

① 1/9   ② 1/8   ③ 1/5   ④ 1/4   ⑤ 1/2

11. A water wave has the wavelength of 10 m and the frequency of 2 Hz. What is the speed of the wave?

① 0.2 m/sec   ② 5 m/sec   ③ 10 m/sec   ④ 20 m/sec   ⑤ 50 m/sec

12. If 50 g of water at a temperature of 30°C is added to 200 g of water at a temperature of 100°C, what will the new temperature of the water be?

① 68°C   ② 80°C   ③ 74°C   ④ 86°C   ⑤ 92°C

13. There is a helium-filled balloon inside a car moving at a constant velocity. The windows are closed and the car is airtight. When the car suddenly accelerates in the forward direction, in which direction will the balloon move?

① backward   ② forward   ③ downward   ④ upward   ⑤ it does not move

14. A clear liquid and a transparent solid have a flat interface. If the refractive index of the liquid is 1.5 and that of the solid is 3, which of the following should be satisfied for total internal reflection to occur at the interface?

|	A light ray is incident from	at an incident angle greater than
①	the solid	$30°$
②	the solid	$60°$
③	the liquid	$30°$
④	the liquid	$60°$
⑤	Total internal reflection does not occur	

15. A photon of light from which of the following electromagnetic radiations carries the largest amount of energy?

① Blue   ② Green   ③ Orange   ④ Red   ⑤ Yellow

16. When we rub a rubber rod with a piece of fur, the rubber rod is found to be charged negatively. If we compare the mass of the rubber rod and the piece of fur before and after the rubbing, which of the following is the correct statement about mass changes?

① There are no mass changes in the rubber rod and the piece of fur

② Only the piece of fur becomes heavier

③ Only the rubber rod becomes heavier

④ The piece of fur becomes heavier, while the rubber rod becomes lighter

⑤ The piece of fur becomes lighter, while the rubber rod becomes heavier

17. There is a uniform electric field in the negative x direction at x>0. A positively charged particle travels with a constant speed in the positive x direction at x<0 and passes x=0 when t=0. Which of the following graphs describes the position of the particle as a function of t afterwards?
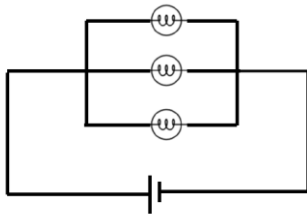

① ② ③ ④ ⑤
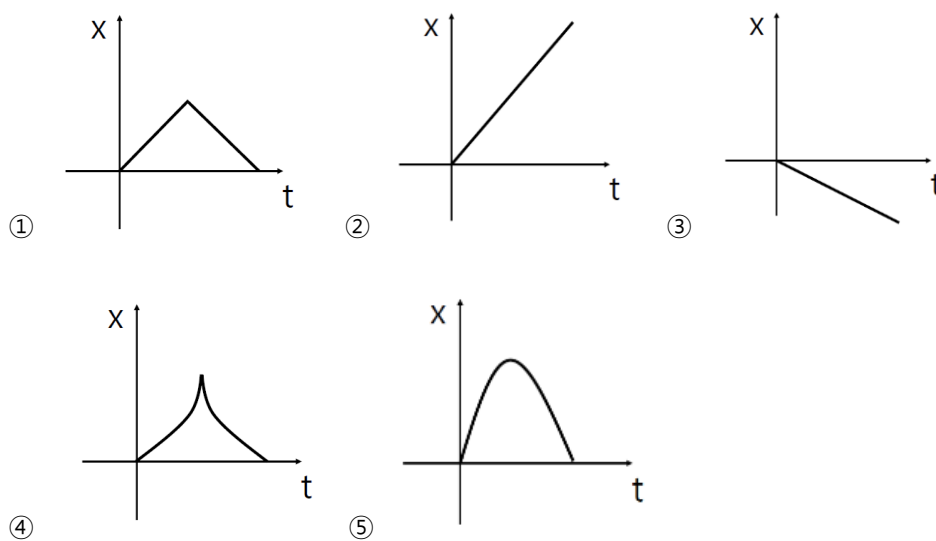
18. Two point charges are separated by 5 cm. The attractive force between them is 20 N. Find the force between them when they are separated by 10 cm.

① 80 N   ② 40 N   ③ 20 N   ④ 10 N   ⑤ 5 N

19. Three identical light bulbs are connected to a source of emf as shown below. What will happen if the middle bulb burns out?

① More current will be drawn from the source of emf.

② All the bulbs will go out.

③ The light intensity of the other two bulbs will decrease.

④ The light intensity of the other two bulbs will increase.

⑤ The light intensity of the other two bulbs will remain the same.

20. In the circuit below, what is the current flowing in the 3 Ω resistor?
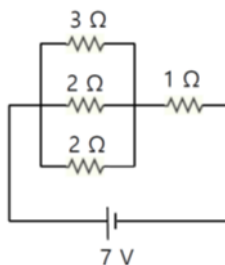
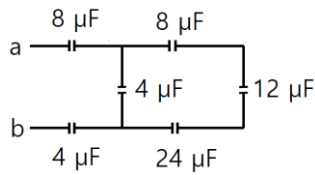① 7/2 A   ② 7/3 A   ③ 1 A   ④ 4/3 A   ⑤ 3/7 A

21. What is the equivalent capacitance between a and b for the group of capacitors in the figure?

8 μF   8 μF
a
    4 μF   12 μF
b
4 μF   24 μF

① 8/7 μF   ② 2 μF   ③ 14 μF   ④ 47/3 μF   ⑤ 60 μF

22. One used 10 lightbulbs of 60 W for 50 hours. The price of electricity is 0.5 dollar per 1 kWh. How much should he pay for electricity?

① 30000 dollars   ② 15000 dollars   ③ 300 dollars   ④ 30 dollars   ⑤ 15 dollars

23. The figure below shows two parallel straight wires that are very long. The wires are separated by a distance of r and carry currents of I_1 and I_2. If all of r, I_1, and I_2 are doubled, the force between the wires

I_1
r
I_2
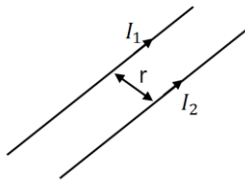
① decreases by a factor of 2   ② increases by a factor of 2

③ decreases by a factor of 4   ④ increases by a factor of 4

⑤ remains the same

24. There is a very long, straight wire carrying a constant current. If a particle of positive charge moves parallel to the current, what will be the direction of the magnetic force on the particle?
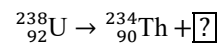
① parallel to the current   ② anti-parallel to the current

③ radially inward toward the wire   ④ radially outward from the wire

⑤ perpendicular to both the current and the radial direction

25. What is the missing particle in the following nuclear decay?

$$^{238}_{92}\text{U} \rightarrow {}^{234}_{90}\text{Th} + \boxed{?}$$

① proton   ② α particle   ③ electron   ④ positron   ⑤ anti-proton