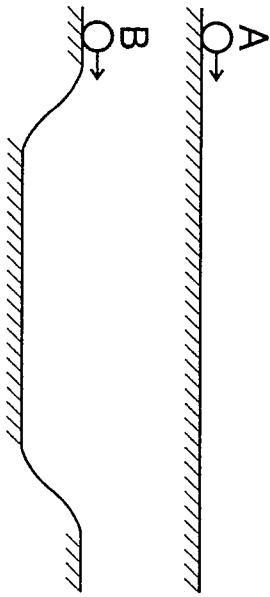


\*請在答案卡內作答

本試卷共有單選題 25 題，每題答對得四分，答錯倒扣一分

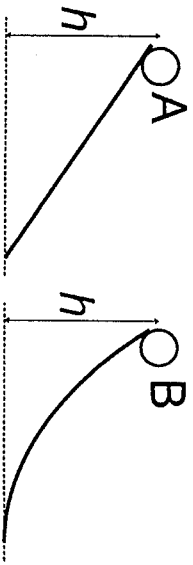
Please note that some physical constants are listed at the end.

- Two balls enter two frictionless tracks at the same time with the same velocity from the left end. Under the influence of gravity, which ball will arrive at the right end first?



- Ball A.
- Ball B.
- Two balls will arrive at the right end at the same time.
- Uncertain; the answer depends on the dip height of the bottom track.
- Uncertain; the answer depends on the track length.

- Two balls are released from rest and fall along two frictionless slides. Which ball will have higher speed when it arrive the end of the track?

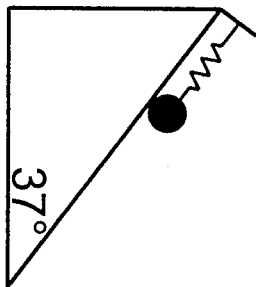


- Ball A.
- Ball B.
- Two balls will have the same speed.
- Uncertain; the answer depends on the height of the slides.
- Uncertain; the answer depends on the curvature of the right slide.

- A mass  $M$  is attached to an ideal spring. When this system is set in motion with amplitude  $A$ , it has a period  $T$ . What is the period if the amplitude of the motion is doubled?

- $0.5T$
- $0.71T$
- $T$
- $1.41T$
- $2T$

- A ball with mass  $m$  is attached to an ideal spring with force constant  $k$  and oscillates on a frictionless slide. What is the oscillation frequency?



- $\frac{1}{2\pi} \sqrt{\frac{3k}{5m}}$
- $\frac{1}{2\pi} \sqrt{\frac{5k}{3m}}$
- $\frac{1}{2\pi} \sqrt{\frac{k}{m}}$
- $\frac{1}{2\pi} \sqrt{\frac{5m}{3k}}$
- $\frac{1}{2\pi} \sqrt{\frac{5k}{3m}}$

- A solid sphere, a hollow sphere, a solid cylinder, and a hollow pipe all have equal masses and radii. If the four are released simultaneously at the top of an inclined plane and roll without slipping, which one will reach the bottom first?
- The solid sphere.
  - The hollow sphere.
  - The solid cylinder.



- The hollow pipe.
- All reach the bottom at the same time.

- A geosynchronous satellite is a satellite with an orbital period the same as the Earth's rotation period. What is the radius of its orbit?
- 35800 km.
  - 71600 km.
  - 143000 km.
  - $1.43 \times 10^7$  km.
  - $1.43 \times 10^9$  km.

- The intensity level at 10 m away from a point source of sound is 80 dB. What will be the intensity level at 20 m away from this source?

- 90 dB.
- 77 dB.
- 74 dB.
- 70 dB.
- 60 dB.

- A 10 Hz sine wave on a string propagates along positive-x direction with speed of 20 m/s and amplitude of 2 cm. If the displacement of the string at  $x = 1$  m and  $t = 0.1$  s is -1 cm, what is the displacement at  $x = 4$  m and  $t = 0.25$  ms?

- 2 cm.
- 1 cm.
- 0 cm.
- 1 cm.
- 2 cm.

- Which gas in the following behaves the most similarly to idea gas?

- $H_2O$
- Ne
- CO
- NO
- $O_2$

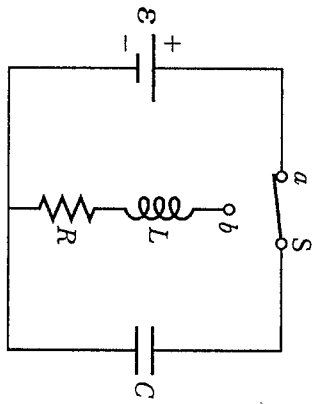
- Which gas in the following has the highest average speed at room temperature?

- Helium

注意：背面有試題

\* 請在答案卡內作答

- b. Ammonia  
c. Nitrogen  
d. Carbon dioxide  
e. They have the same average speed
11. A hot spoon is dropped into a tank of cold water and the temperature eventually stabilizes. Which statement is true then?  
a. The entropy lost by the spoon is equal to the entropy gained by the water.  
b. The entropy gained by the water is equal to the entropy lost by the spoon.  
c. The water loses less entropy than the spoon gains.  
d. The water gains more entropy than the spoon loses.  
e. The water gains less entropy than the spoon loses.
12. A positive point charge  $Q$  is fixed on a very large horizontal frictionless tabletop. A second positive point charge  $q$  is released from rest near the stationary charge and is free to move. Which statement describes the motion of  $q$  after it is released?  
a. Its speed will be greatest just after it is released.  
b. Its acceleration is zero just after it is released.  
c. As it moves farther and farther from  $Q$ , its speed will keep increasing.  
d. As it moves farther and farther from  $Q$ , its acceleration will keep increasing.  
e. None of the above
13. A current source is used to charge a coil inductor. If the coil is compressed to half of its original length, which quantity will not be doubled?  
a. Inductance of the coil  
b. Charge time of the coil  
c. Stored energy of the coil after it is charged  
d. Magnetic field in the coil  
e. None of the above
14. Which statement about the potential due to a positive charged conducting sphere in electrostatic equilibrium is true? All potentials are measured relative to infinity.  
a. The potential at the surface of the sphere is lower than zero.  
b. The potential at the center of the sphere is zero.  
c. The potential at the surface is higher than the potential at the center.  
d. The potential at the surface is lower than the potential at the center.  
e. None of the above.
15. Let  $R = 1.5 \Omega$ ,  $L = 2.2 \text{ mH}$  and  $C = 1.8 \mu\text{F}$  in the circuit. After the capacitor is fully charged by the battery, switch is thrown position  $b$ . Roughly how many current oscillations will the resistor experience before the current dies out?  
a. 1  
b. 10  
c. 100  
d. 1000  
e. 10000
16. A coil in a 60-Hz ac generator has 120 turns, each having an area of  $3.1 \times 10^{-2} \text{ m}^2$  and is rotated in a uniform magnetic field of 0.12 Tesla. What is the peak output voltage of this generator?  
a. 110 V  
b. 120 V  
c. 170 V  
d. 200 V  
e. 220 V
17. Which of the following statements is correct?  
a. Sun light is polarized.
18. A high-power laser with 1.0 mm beam diameter is used to cut through metals. The laser generates peak electric field of 0.70 MV/m at the target. What is the power delivered by the laser?  
a. 500 W  
b. 1.0 kW  
c. 2.0 kW  
d. 4.1 kW  
e. 2.0 MW
19. When two beams of light are coherent, which statement is true?  
a. Their amplitudes are identical.  
b. Their phase difference is fixed.  
c. Their propagation speeds are the same.  
d. Their propagation directions are the same.  
e. All of the above.
20. 520-nm light in air incidents a soap film ( $n = 1.3$ ) having air on both sides of it. When viewing the film by reflected light, what is the minimum thickness of the film that will give an interference maximum when the light is incident normally on it?  
a. 50 nm  
b. 100 nm  
c. 150 nm  
d. 200 nm  
e. 250 nm
21. An asteroid  $40 \times 10^6 \text{ km}$  away appears on a collision course with earth. What's the minimum size for the asteroid that could be resolved with the 2.4-m-diameter diffraction-limited Hubble Space Telescope, using 550-nm reflected



物理專用

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- sunlight?
- 11 m
  - 110 m
  - 1.1 km
  - 11 km
  - 110 km

22. What is not an Invariant under Lorentz transformation?
- Speed of light
  - Charge
  - Energy
  - Rest mass
  - None of the above

23. A blackbody at absolute temperature  $T$  radiates its peak intensity at wavelength  $\lambda$ . However, another blackbody radiates its peak intensity at wavelength  $2\lambda$ ; what would be the temperature of the second blackbody?
- $0.5T$
  - $0.84T$
  - $T$
  - $2T$
  - $16T$

24. A photon of wavelength 71.20 pm is scattered through an angle of  $180^\circ$  by a stationary electron. What is the wavelength of the scattered photon?
- 66.36 pm
  - 68.78 pm
  - 71.20 pm
  - 73.62 pm
  - 76.04 pm

25. A beam of blue light, a beam of red light and a beam of green light each deliver the same power on a surface. For which beam is the number of photons hitting the surface per second the greatest?
- The blue beam.
  - The red beam.
  - The green beam.
  - The same for both beams.
  - Uncertain; the answer depends on the medium the light travels.

Earth's mass  $m_{\text{earth}} = 5.97 \times 10^{24}$  kg  
 Gravitational constant  $G = 6.67 \times 10^{-11}$  N·m<sup>2</sup>/kg<sup>2</sup>  
 Mass of electron  $m_e = 9.11 \times 10^{-31}$  kg  
 Elementary charge  $e = 1.60 \times 10^{-19}$  C  
 Permeability constant  $\mu_0 = 1.26 \times 10^{-6}$  N/A<sup>2</sup>  
 Planck constant  $h = 6.63 \times 10^{-34}$  J·s  
 Speed of light  $c = 3.00 \times 10^8$  m/s

