

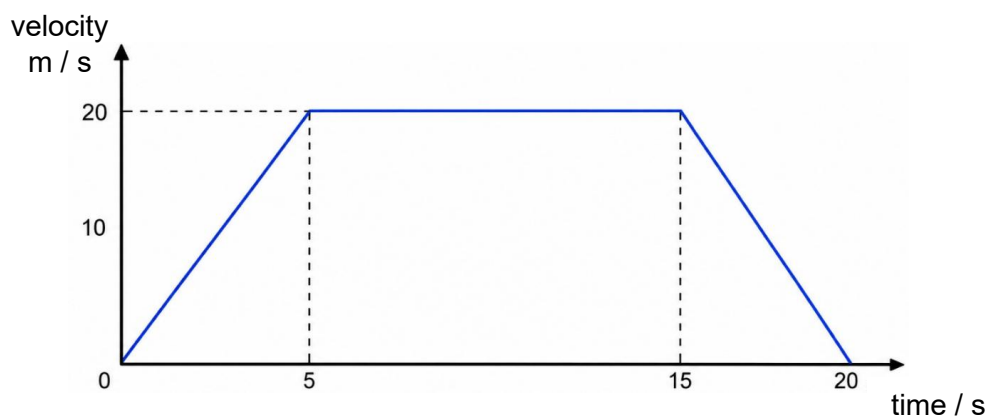
1 Which of the following is equivalent to a unit of power expressed in SI base units?

- A** kg m / s **B** $\text{kg m}^2 / \text{s}^2$ **C** $\text{kg m}^2 / \text{s}^3$ **D** kg / m s^2

2 Which pair of instruments is most suitable for measuring the internal diameter of a laboratory test tube and the diameter of a thin copper wire?

	internal diameter of a test tube	diameter of a thin copper wire
A	metre rule	digital calipers
B	digital calipers	digital micrometer screw gauge
C	digital calipers	metre rule
D	measuring tape	digital micrometer screw gauge

3 A car moves along a straight road. Its velocity-time graph shows uniform acceleration from rest to 20 m / s in 5 s , followed by a constant velocity of 20 m / s for another 10 s , and finally a uniform deceleration to rest in the last 5 s .



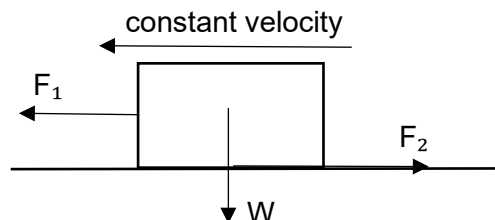
What is the total distance travelled by the car?

- A** 300 m **B** 350 m **C** 400 m **D** 500 m

4 A sprinter starts from rest and accelerates uniformly. He reaches a speed of 8.0 m / s after travelling a distance of 16 m .
What is the magnitude of the sprinter's acceleration?

- A** 0.25 m / s^2 **B** 0.50 m / s^2 **C** 1.0 m / s^2 **D** 2.0 m / s^2

- 5 A ball is dropped from an aircraft at a certain height. Taking air resistance into account, how do the velocity and the acceleration of the ball change as it falls before reaching terminal velocity?
- A Velocity increases, acceleration increases.
 B Velocity increases, acceleration decreases.
 C Velocity decreases, acceleration increases.
 D Velocity decreases, acceleration decreases.
- 6 A rocket of mass M is in deep space. Its engine exerts a constant thrust F . As the rocket travels, it consumes fuel, causing its mass to decrease to $0.5M$. How does the acceleration of the rocket change?
- A It increases to twice its initial value.
 B It remains constant.
 C It decreases to half its initial value.
 D It increases to four times its initial value.
- 7 An object of weight W moves to the left at constant velocity along a rough horizontal floor. A horizontal driving force of magnitude F_1 acts on the object in the direction of motion, and a frictional force of magnitude F_2 opposes the motion.

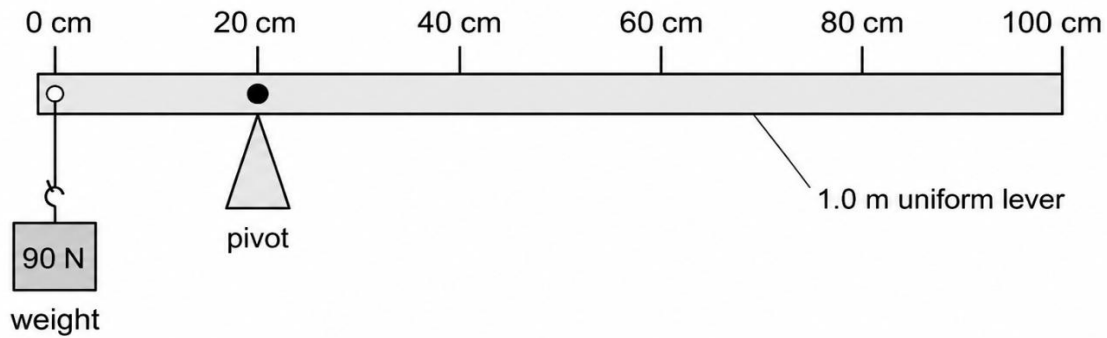


Which statement is correct?

- A F_1 and F_2 are an action-reaction pair.
 B $F_1 = F_2$ but they are not an action-reaction pair.
 C $F_1 + F_2 = W$
 D $F_1 > F_2$
- 8 An astronaut has a weight of 800 N on Earth where $g = 10 \text{ N / kg}$. On Planet X, his weight is 320 N. What is the gravitational field strength on Planet X?

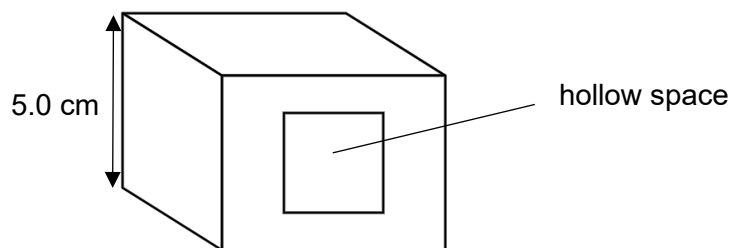
- A 2.5 N / kg B 3.0 N / kg C 4.0 N / kg D 8.0 N / kg

- 9 A uniform 1.0 m lever has a weight of 20 N and is pivoted at the 20 cm mark. A 90 N weight is hung at the 0 cm mark.



What vertical force must be applied at the 100 cm mark to keep the lever horizontal?

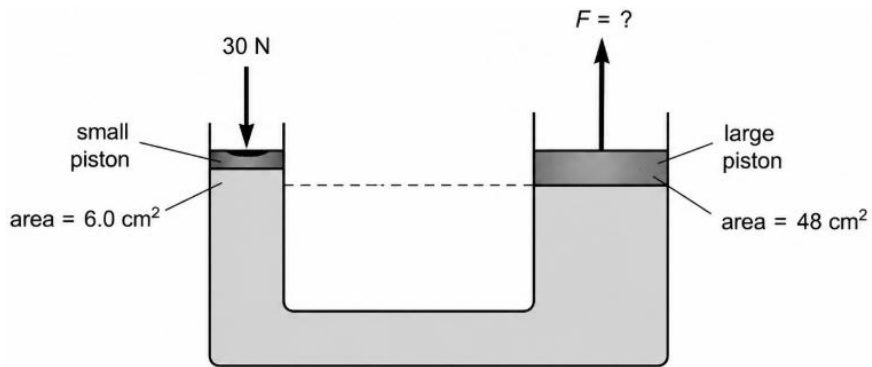
- A 15 N B 20 N C 30 N D 60 N
- 10 Which action increases the stability of a tall bus?
- A Increasing the height of the bus roof.
B Increasing the number of passengers on the upper deck.
C Placing the heavy engine at the bottom of the bus.
D Using narrower tires.
- 11 A metal cube has sides of length 5.0 cm and a mass of 945 g. The density of the metal is 9.0 g / cm^3 . There is a hollow space in the middle of the cube.



What is the volume of the hollow space?

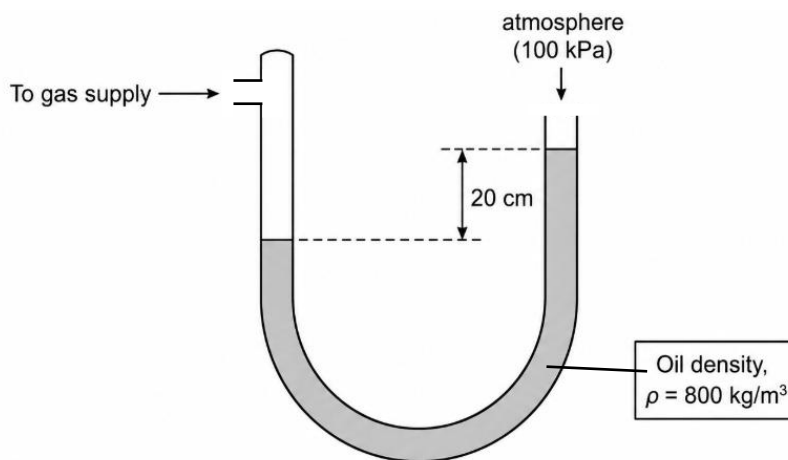
- A 5.0 cm^3 B 15 cm^3 C 20 cm^3 D 105 cm^3

- 12** A hydraulic lift consists of a small piston and a large piston. The cross-sectional area of the small piston is 6.0 cm^2 and the cross-sectional area of the large piston is 48 cm^2 . A downward force of 30 N is applied to the small piston.



What is the upward force exerted by the large piston?

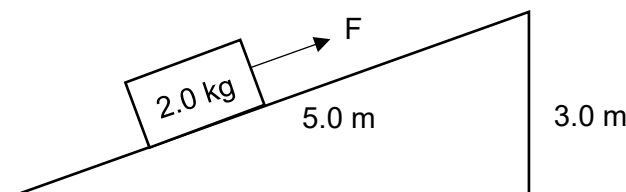
- A** 4.0 N **B** 30 N **C** 180 N **D** 240 N
- 13** A U-tube manometer contains oil of density 800 kg / m^3 . One end is open to the atmosphere of 100 kPa and the other is connected to a gas supply. The height difference of the oil levels is 20 cm .



What is the pressure of the gas supply? ($g = 10 \text{ N / kg}$)

- A** 84.0 kPa **B** 98.4 kPa **C** 100.2 kPa **D** 101.6 kPa

- 14 A 2.0 kg block is pushed up a 5.0 m long frictionless incline to a vertical height of 3.0 m.



How much work is done against gravity? ($g = 10 \text{ N/kg}$)

- A** 30 J **B** 45 J **C** 60 J **D** 100 J
- 15 Object X of mass m moves at a speed of v . Object Y has half the mass of X but moves at twice the speed of X.
What is the ratio of the kinetic energy of object X to the kinetic energy of object Y?
- A** 1 : 1 **B** 1 : 2 **C** 1 : 4 **D** 1 : 8
- 16 Smoke particles suspended in air are viewed through a microscope. They are seen moving in a zig-zag path.
What does this observation provide evidence for?
- A** Air is a poor thermal conductor.
B Air molecules are moving in constant random motion.
C Air molecules have a larger mass than smoke particles.
D Convection currents are occurring in the air.
- 17 A sealed rigid container holds a fixed mass of gas. The gas is heated from 27°C to 127°C at constant volume.
Which statement best explains, in terms of the kinetic particle model, why the pressure of the gas increases?
- A** The molecules increase in size, causing more frequent collisions with the walls.
B The average speed of the molecules increases, so they collide with the walls more frequently and with greater force.
C The number of molecules in the container increases.
D The molecules move further apart, reducing the frequency of collisions.

18 Three students make statements about thermal radiation.

1 Dull black surfaces are better absorbers of thermal radiation than shiny silver surfaces.

2 Thermal radiation can travel through a vacuum.

3 The rate of energy transfer by thermal radiation depends on the surface temperature of the body.

Which statements are correct?

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

19 Which of the following best explains why a metal spoon feels colder to the touch than a wooden spoon, even though both are at room temperature?

A Metal has a lower specific heat capacity than wood.

B Metal is a better thermal conductor, so it conducts heat away from the hand more quickly.

C Metal has a higher density than wood, so it absorbs more heat.

D Wood emits more thermal radiation than metal.

20 An electric heater, connected to a 240 V supply, draws a current of 7.0 A. It is used to heat 400 g of water for 1.5 minutes.

What is the increase in temperature of the water?

(specific heat capacity of water = 4.2 J / (g °C))

A 45 °C

B 50 °C

C 65 °C

D 90 °C

21 A kettle rated at 2.0 kW is used to boil water. After the water reaches 100 °C, the kettle continues to operate for a further 3.0 minutes, during which 160 g of water is converted into steam.

What is the specific latent heat of vaporisation of water?

A 720,000 J / kg

B 1,125,000 J / kg

C 2,250,000 J / kg

D 4,500,000 J / kg

22 A source produces waves with a frequency of 50 Hz and a wavelength of 0.2 m.

How long does it take for a wave to travel 100 m?

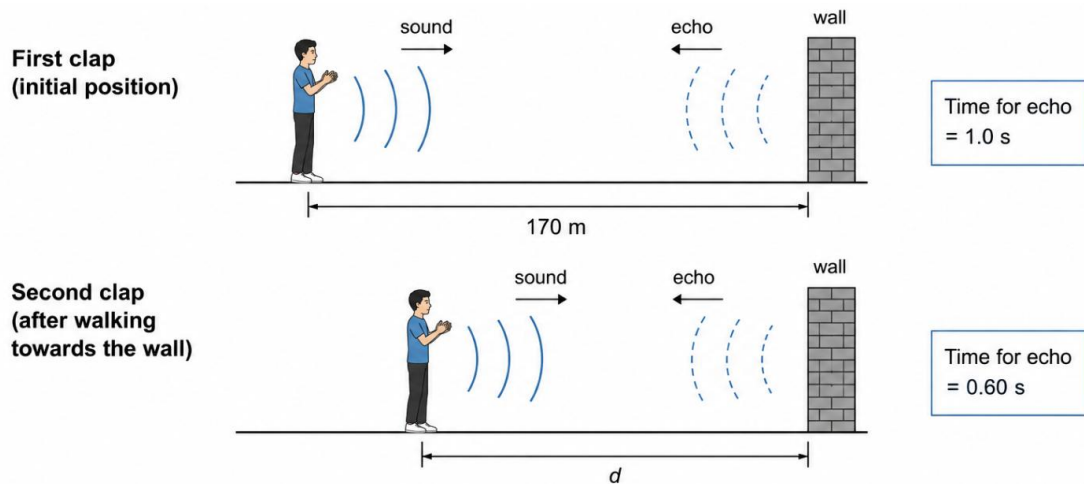
A 10 s

B 20 s

C 50 s

D 100 s

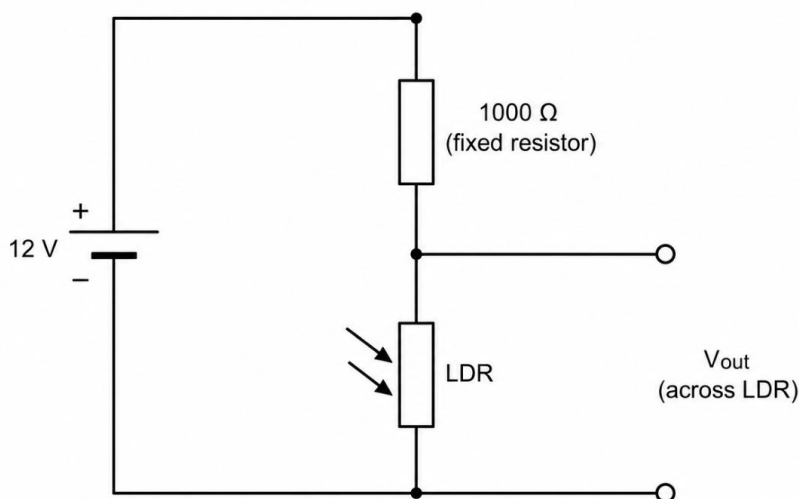
- 23** A man standing 170 m from a wall claps his hands and hears the echo after 1.0 s. He then walks towards the wall and claps again. This time, he hears the echo after 0.60 s.



Assuming the speed of sound is constant, how far did the man walk towards the wall?

- A** 34 m **B** 68 m **C** 102 m **D** 136 m
- 24** Which EM wave is used in airport security to identify hidden objects in luggage?
- A** infrared radiation
B radio waves
C ultraviolet radiation
D X-rays
- 25** A ray of light travels from air into a glass block of refractive index 1.5, at an angle of incidence of 45° .
What is the angle of refraction?
- A** 28.1° **B** 30.0° **C** 45.0° **D** 67.5°
- 26** An object is placed 10 cm from a converging lens with a focal length of 15 cm.
Which description of the image is correct?
- A** real, inverted
B real, upright
C virtual, inverted
D virtual, upright

- 27** A plastic rod is rubbed with a wool cloth and the rod becomes negatively charged. Which statement is correct?
- A** Electrons moved from the cloth to the rod.
 - B** Protons moved from the rod to the cloth.
 - C** The rod gained positive ions.
 - D** The cloth became negatively charged.
- 28** A battery drives a current of 2.0 A through a circuit for 3.0 minutes. What is the size of the charge that passes through the circuit?
- A** 0.011 C
 - B** 0.67 C
 - C** 6.0 C
 - D** 360 C
- 29** Two resistors of $6.0\ \Omega$ and $12\ \Omega$ are connected in parallel, and this combination is connected in series with a third resistor of $3.0\ \Omega$. What is the total effective resistance of the circuit?
- A** $4.0\ \Omega$
 - B** $7.0\ \Omega$
 - C** $9.0\ \Omega$
 - D** $21\ \Omega$
- 30** The diagram shows a potential divider with a 12 V battery, a $1000\ \Omega$ fixed resistor, and an LDR. How does the output voltage change when the light intensity increases?



- A** It decreases.
- B** It increases.
- C** It stays at 12 V.
- D** It drops to zero.

- 31 An appliance rated “240 V, 2300 W” is used together with a second appliance rated “240 V, 460 W” on the same circuit. Which single fuse rating is most suitable to protect both appliances operating together?

A 3 A B 5 A C 10 A D 13 A

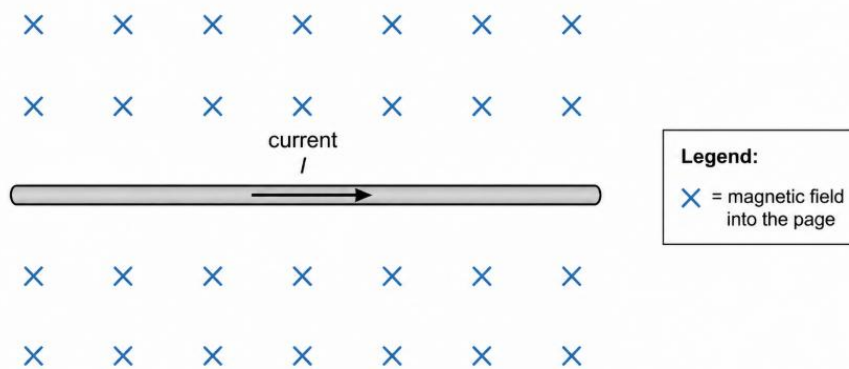
- 32 A metal-cased electric kettle develops a fault in which the live wire touches the metal casing. Which safety feature is most important in preventing the user from receiving an electric shock in this situation?

A The double insulation of the power cable.
B The earth wire connected to the metal casing.
C The neutral wire returning current to the supply.
D The neutral wire connected to the metal casing.

- 33 A metal bar is placed inside a coil of wire carrying a large direct current. When the current is switched off, the bar retains its magnetism. What is the bar made from?

A aluminium B copper C iron D steel

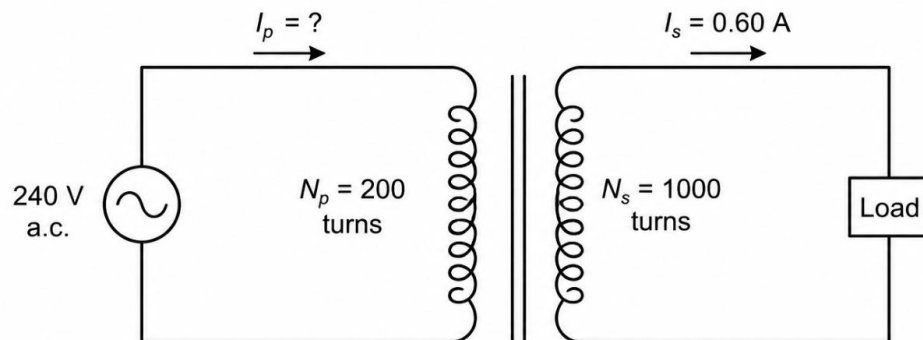
- 34 A straight current-carrying wire lies in a magnetic field.



Which direction does the wire experience a force?

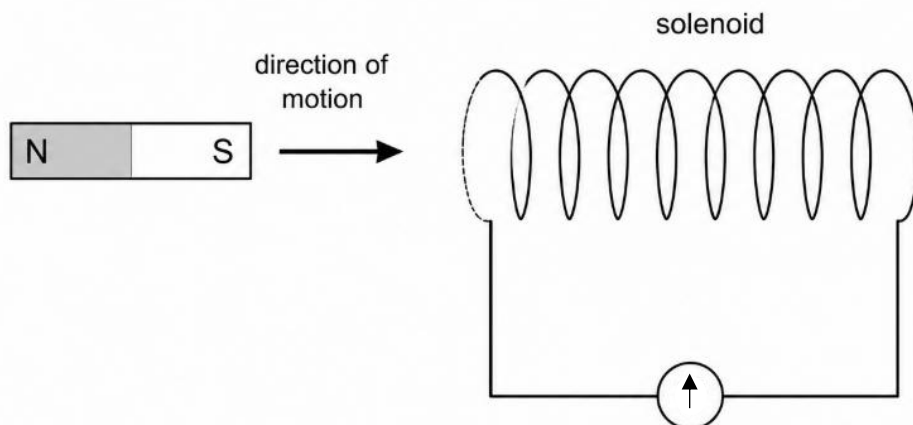
A downward (towards the bottom of the page)
B into the page
C out of the page
D upward (towards the top of the page)

- 35 An ideal transformer is shown below.



What is the current in the primary coil?

- A** 0.12 A **B** 3.0 A **C** 5.0 A **D** 30 A
- 36 A magnet is pushed into a solenoid as shown below.



Which of the following actions will increase the magnitude of the induced e.m.f.?

- A** Holding the magnet stationary inside the solenoid.
B Moving the magnet more slowly.
C Using a solenoid with fewer turns of wire.
D Using a stronger permanent magnet.

37 Three students make statements about the penetrating power of radioactive emissions.

- 1** Alpha particles are stopped by a single sheet of paper.
- 2** Beta particles can be stopped by a few millimetres of aluminium.
- 3** Gamma radiation is not significantly absorbed even by thick lead.

Which statements are correct?

- A** 1 only
- B** 1 and 2 only
- C** 2 and 3 only
- D** 1, 2 and 3

38 A technician works with a radioactive source in a laboratory. Which action would most effectively reduce the technician's exposure to radiation from the source?

- A** Holding the source directly with bare hands instead of using tongs.
- B** Increasing the time spent near the source.
- C** Removing any lead shielding around the source.
- D** Standing further away from the source.

39 A radioactive source has a half-life of 10 minutes. After 30 minutes, its activity is measured to be 100 counts / s. What was the initial activity of the source?

- A** 100 counts / s **B** 200 counts / s **C** 400 counts / s **D** 800 counts / s

40 A radioactive nucleus first emits a beta (β) particle, and the resulting nucleus then emits an alpha (α) particle. What is the overall change in the atomic (proton) number of the original nucleus?

- A** It decreases by 1.
- B** It decreases by 3.
- C** It increases by 1.
- D** It stays the same.

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