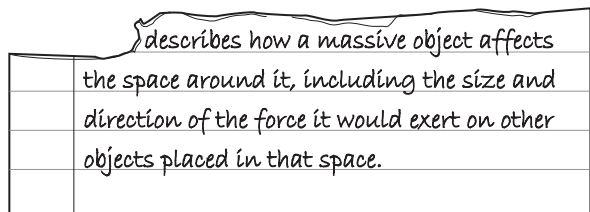


- 1 A student determines the diameter of a metal ball.
- Which apparatus is needed to get an accurate measurement?
- A a ruler and a protractor
- B a ruler only
- C a protractor and a set square
- D a ruler and two rectangular blocks
- 2 An athlete runs at a speed of 8 m/s for 10 s, and then at a speed of 6 m/s for 12 s.

Which calculation gives the average speed of the athlete in m/s?

- A $\frac{8+6}{2}$
- B $\frac{(8 \times 10) + (6 \times 12)}{22}$
- C $\frac{(8 \div 10) + (6 \div 12)}{22}$
- D $\frac{(10 \div 8) + (12 \div 6)}{22}$

- 3 A piece of paper torn out of an exercise book is shown.



What is being described?

- A gravitational charge
- B gravitational field
- C gravitational mass
- D gravitational potential energy

- 18 Parallel waves in a ripple tank are diffracted as they pass through a gap in a barrier.

Three changes that can be made to this arrangement are listed.

- 1 Decrease the wavelength of the waves.
- 2 Increase the amplitude of the waves.
- 3 Decrease the size of the gap.

Which changes will cause the shape of the diffracted waves to be less curved?

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

- 22 Ultraviolet radiation and infrared radiation are both parts of the electromagnetic spectrum.

However, they differ in wavelength and frequency.

Which row describes how they differ?

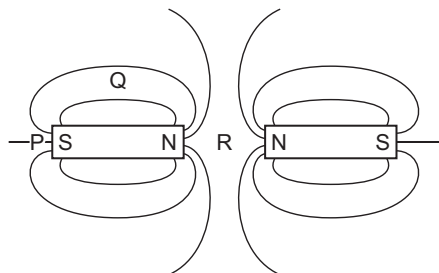
	ultraviolet	infrared
A	longer wavelength than infrared	higher frequency than ultraviolet
B	longer wavelength than infrared	lower frequency than ultraviolet
C	shorter wavelength than infrared	higher frequency than ultraviolet
D	shorter wavelength than infrared	lower frequency than ultraviolet

- 23 A police car with its siren sounding is stationary in heavy traffic. A pedestrian notices that, although the loudness of the sound produced does **not** change, the pitch varies.

Which row describes the amplitude and the frequency of the sound?

	amplitude	frequency
A	constant	constant
B	constant	varying
C	varying	constant
D	varying	varying

24 The diagram shows part of the magnetic field around two magnets.



Which list gives the order of magnetic field strengths at the positions P, Q and R, from weakest to strongest?

- A** $P \rightarrow Q \rightarrow R$
B $P \rightarrow R \rightarrow Q$
C $Q \rightarrow P \rightarrow R$
D $R \rightarrow Q \rightarrow P$

24 Which statements about magnets are correct?

- 1 Permanent magnets are made of steel.
- 2 Electromagnets are temporary magnets.
- 3 A magnet can be used to induce magnetism in an iron bar.

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

29 An electrical appliance has a symbol on it to indicate it is double-insulated.

Which statement is correct?

- A** A two-core, flexible cable with **no** earth wire is used to connect it to the mains supply.
B It needs an earth wire that is connected to a fuse.
C **No** fuse or circuit breaker is needed.
D The cable should be connected to the live and earth connectors of the plug but **not** the neutral.

1 A train travels with a constant velocity of 56 m/s on a horizontal track. The mass of the train is 440 000 kg.

(a) State the difference between the velocity of the train and its speed.

.....
 [1]

(b) Calculate the kinetic energy stored in the moving train.

kinetic energy = [2]

(c) (i) The train has a uniform deceleration of 1.2 m/s^2 .

Calculate the constant braking force which brings the train to rest.

force = [2]

(ii) Calculate the distance travelled by the train as it comes to rest.

distance = [3]

[Total: 8]

5 A dolphin communicates with other dolphins underwater by emitting sounds in the range 7–15 kHz.

- (a) State the value of the speed of sound in air and state how the speed of sound in water differs from the speed of sound in air.

speed of sound in air m/s
 speed of sound in water
 [1]

- (b) State and explain if humans with normal hearing can hear all the sounds emitted by the dolphin.

statement
 explanation

 [2]

- (c) Complete Table 5.1 to describe differences in loudness and pitch of two different dolphin sounds.

Table 5.1

Frequency /kHz	amplitude	loudness	pitch
14	large		
8	small		

[2]

- (d) Complete the sentences to describe how sound is transmitted through water.

Sound waves are made of vibrating which produce
 compressions and rarefactions. A compression is a region of
 and a rarefaction is a region of The sound waves travel
 to the direction of the vibrations.

[3]

[Total: 8]

- 8 (a) State what is meant by a magnetic field.

.....
 [1]

- (b) Fig. 8.1 shows an ammeter connected to a coil wound on a thin plastic cylinder. A small trolley is placed on a curved track which passes through the cylinder.

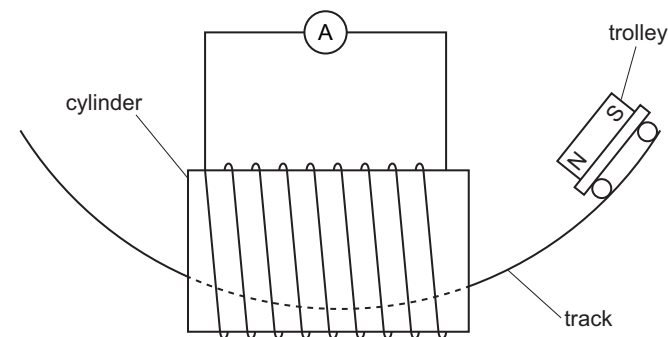


Fig. 8.1

The trolley is released from the position shown in Fig. 8.1. It travels through the coil from right to left. The trolley travels back from left to right. It has a lower maximum speed when it travels from left to right.

The plastic cylinder does not affect any magnetic field. A magnet is fixed to the trolley.

- (i) State why there is a lower maximum speed when the trolley travels back from left to right.

.....
 [1]

- (ii) Fig. 8.2 shows a close-up view of the ammeter.

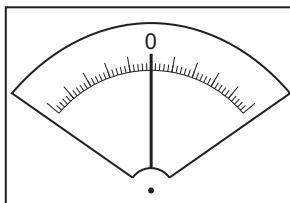


Fig. 8.2

As the trolley enters the coil moving from right to left, the ammeter needle deflects to the left and then returns to zero.

State and explain any changes to the deflection on the ammeter as the trolley enters the coil when moving back from left to right.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 5]

- 5 (a) (i) Electromagnetic waves have many uses.

On Fig. 5.1 draw **one** line from each use to the region of the electromagnetic (e-m) spectrum it uses.

Use	Region of e-m spectrum
security marking	gamma rays
Bluetooth	ultraviolet
optical fibres	infrared
detection of cancer	radio waves

Fig. 5.1

[2]

- (ii) State **one** advantage of using microwaves compared with radio waves to transmit mobile (cell) phone signals.

.....

..... [1]

- (b) Describe the difference between transverse waves and longitudinal waves.

.....

.....

.....

..... [2]

- (c) Fig. 5.2 shows a simplified diagram of seismic P-waves travelling through the Earth. The paths of the waves are curved. Seismic waves are produced by rock movements in earthquakes.

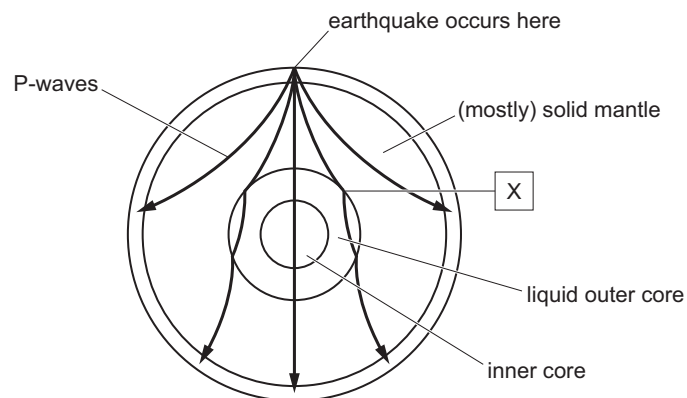


Fig. 5.2 (not to scale)

- (i) State the type of wave that P-waves can be modelled as.
- [1]
- (ii) At point X, the P-wave travels from the solid mantle to the liquid core. There is a sudden change in direction of the path of the wave.
- Explain the change in direction of the P-wave at point X.
-
-
- [2]
- (d) The Earth's surface absorbs incoming radiation from the Sun and also emits thermal radiation from its surface.

Over the past 50 years, scientists estimate that the average temperature of the Earth's surface has increased by approximately 0.75°C .

Explain what is causing this average temperature rise.

.....

.....

.....

..... [2]

- 4 Fig. 4.1 shows a heater used to warm the air in a room.

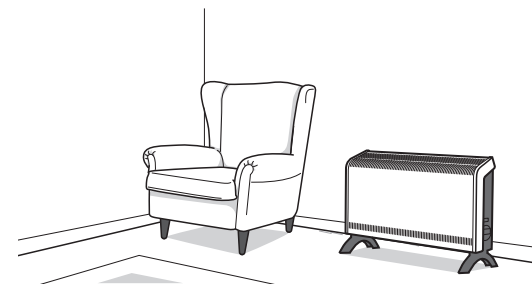


Fig. 4.1

- (a) (i) State the main method of thermal energy transfer throughout the air in the room.
- [1]
- (ii) Explain how the heater warms **all** the air in the room.
-
-
-
- [3]
- (b) The power of the heater is 2.0 kW when it is connected to the mains supply with an e.m.f. of 230 V .
- (i) Show that the current in the heater is approximately 8.7 A .
-
- [2]
- (ii) The plug connecting the heater to the mains supply is fitted with a fuse.
- Fuse ratings of 3 A , 5 A , 10 A and 13 A are available.
- State which fuse is used. Explain your answer.
- fuse
- explanation
-
- [2]

- 5 A ray of light is incident on a soap film. Fig. 5.1 shows a magnified image of a small part of the soap film. The ray of light is refracted as it enters the soap film.

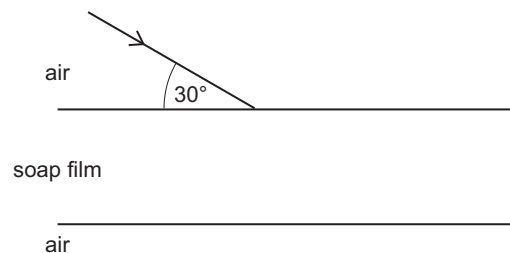


Fig. 5.1

The refractive index of the soap film is 1.28.

- (a) Define refractive index in terms of the speed of light.

.....
 [1]

- (b) (i) Show that the angle of refraction as the light enters the soap film is approximately 43° .

[2]

- (ii) On Fig. 5.1, carefully draw the refracted light ray in the soap film and label the angle of refraction. [2]

- (c) The ray of light is monochromatic red light with a wavelength of 680 nm in air.

- (i) Define monochromatic.

.....
 [1]

- (ii) Calculate the frequency of the light.

frequency = [3]

Total: 91

- 6 Fig. 6.1 shows a person using a magnetic window cleaner. The part on the outside of the window is attracted to the inside part through the glass window.



Fig. 6.1

Each part of the window cleaner contains two magnets. Fig. 6.2 shows the magnetic field between the parts of the window cleaner.

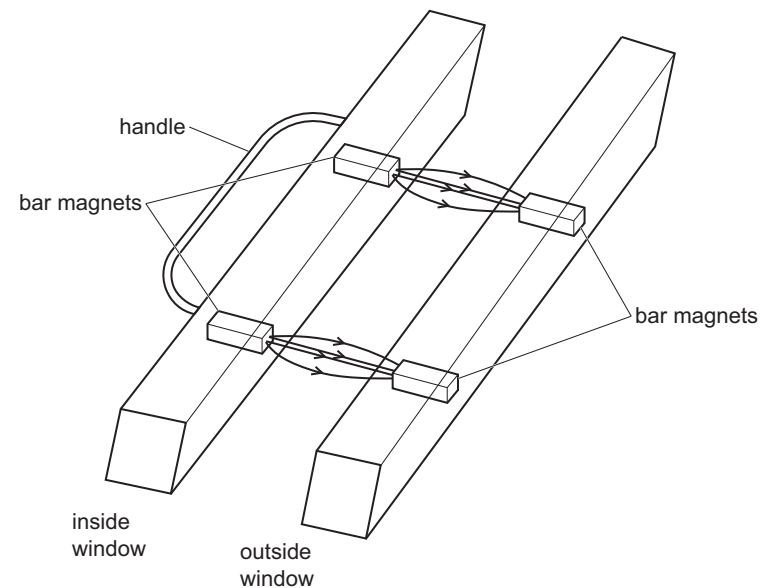


Fig. 6.2

- (a) Glass is **not** a magnetic material.

State the difference between magnetic and non-magnetic materials.

.....
 [1]

- (b) Suggest a suitable material for the magnets in the window cleaner. Explain your answer.

.....
 [1]

- (c) Label the poles of the magnets in Fig. 6.2. [1]

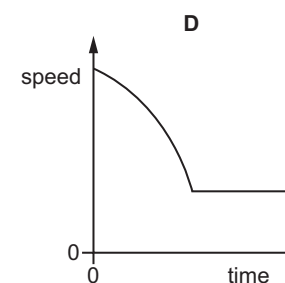
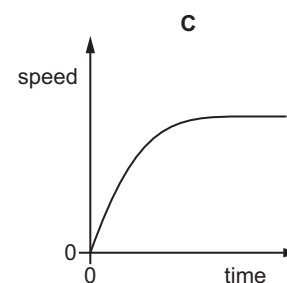
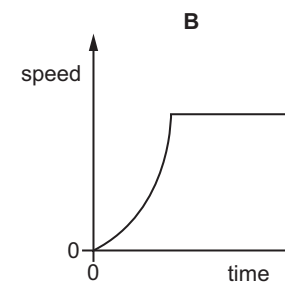
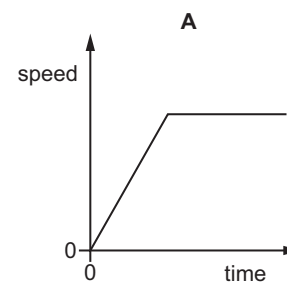
- (d) State how the field lines in Fig. 6.2 show different strengths of the magnetic field between the magnets.

.....
 [1]

[Total: 4]

- 3 An object reaches terminal velocity after being dropped and falling through air.

Which graph shows how its speed varies with time?



3 Liquids are difficult to compress whereas gases can be compressed easily.

(a) Explain, in terms of particles, why it is difficult to compress liquids.

.....

 [2]

(b) Fig. 3.1 shows a rectangular block floating in water. The density of the water is 1000 kg/m^3 .

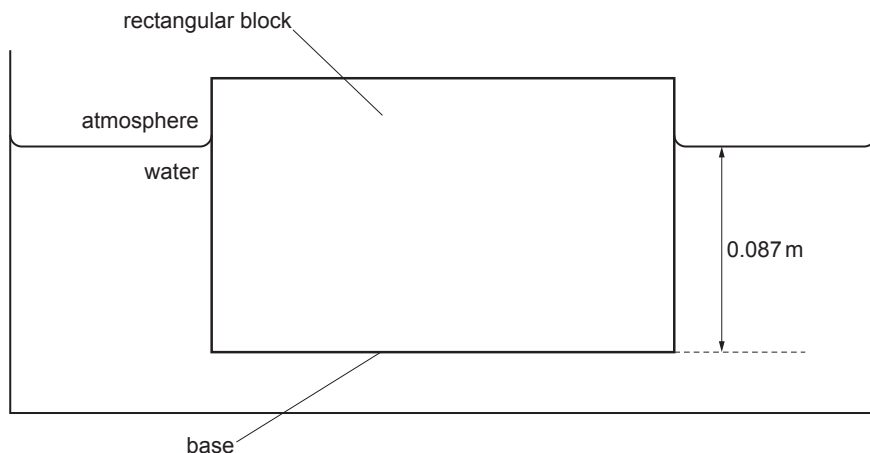


Fig. 3.1

The area of the base of the block is 0.014 m^2 . The base of the block is at a depth of 0.087 m below the surface of the water.

(i) Show that the pressure due to the water at the base of the block is approximately 850 Pa .

[2]

(ii) Calculate the force F on the base of the block caused by the pressure given in (b)(i).

$F =$ [2]

(iii) Force F is equal to the weight of the block.

Calculate the mass of the block.

mass = [2]

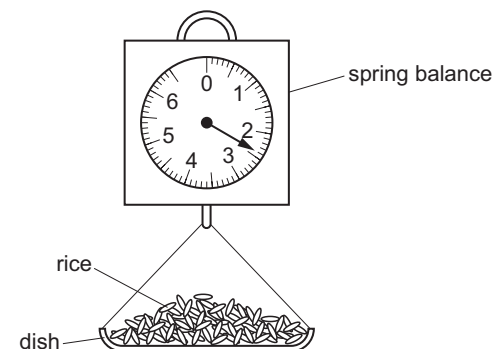
2 An object falls towards the surface of the Earth.

The object is falling at its terminal velocity.

Which statement is correct?

- A There is air resistance and the acceleration of the object is negative.
- B There is air resistance and the acceleration of the object is zero.
- C There is no air resistance and the acceleration of the object is negative.
- D There is no air resistance and the acceleration of the object is zero.

5 A shopkeeper pours rice into a dish that hangs from a spring balance. He records the reading.



A customer buys some pasta. The shopkeeper notices that the reading on the spring balance, with just pasta in the dish, is the same as it was with just rice in the dish.

Which quantity **must** be the same for the rice and for the pasta?

- A density
- B temperature
- C volume
- D weight