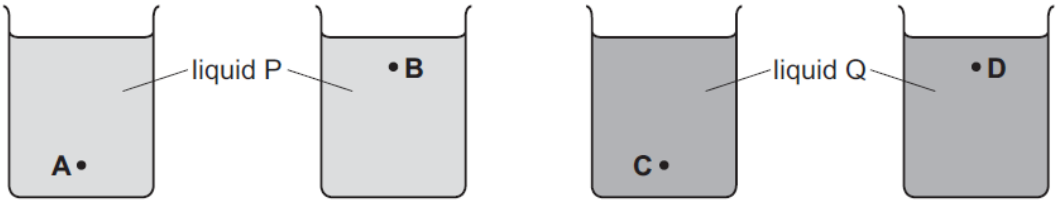
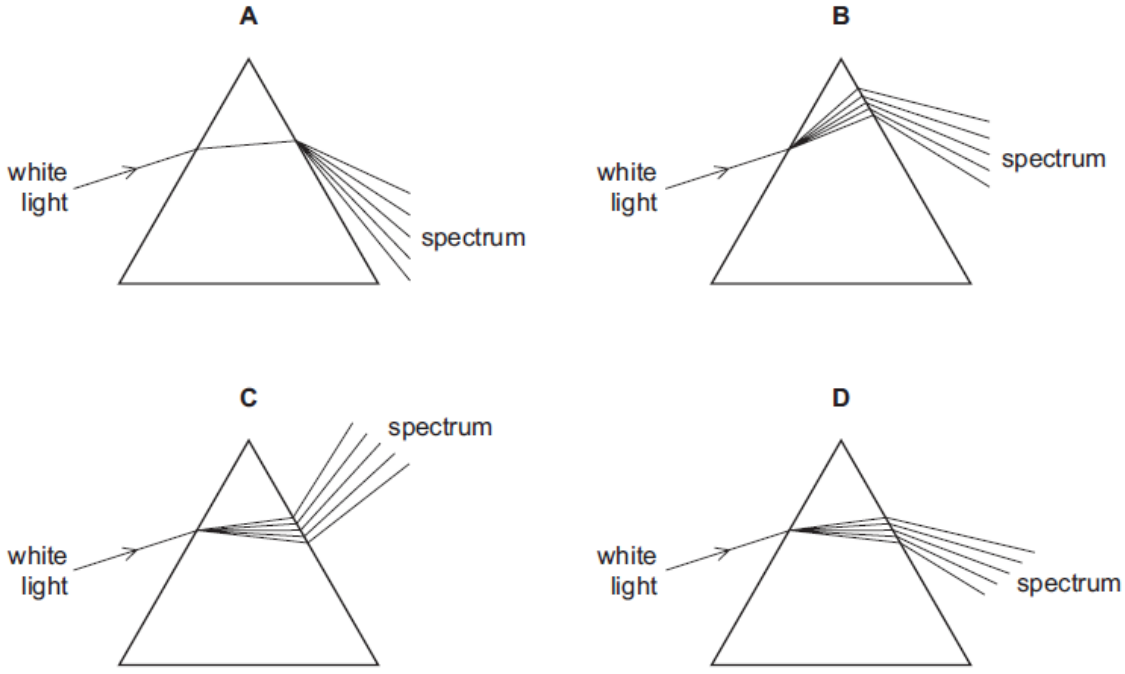
SAMPLE EXAMINATION QUESTIONS FOR THE PHYSICS GLOBAL FINAL - CATEGORY 1 (GRADES 7-8)

Q1. What is a reasonable estimate of the average gravitational force acting on a fully grown woman standing on the Earth?
A. 60 N
B. 250 N
C. 350 N
D. 650 N

Q2. Four identical beakers are filled with equal volumes of liquids P or Q, as shown. Liquid P is more dense than liquid Q. At which point is the pressure the least?

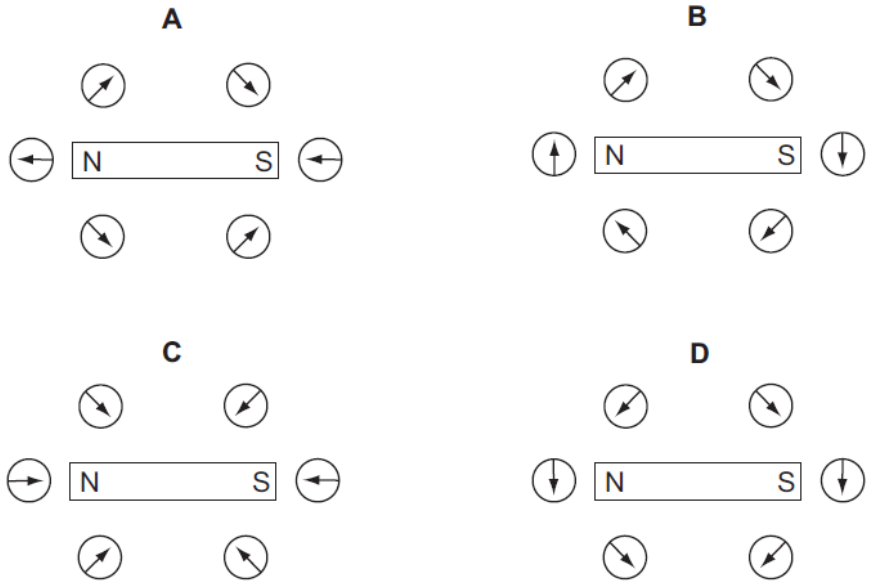


Q3. Which diagram shows what happens when a ray of white light passes through a prism?

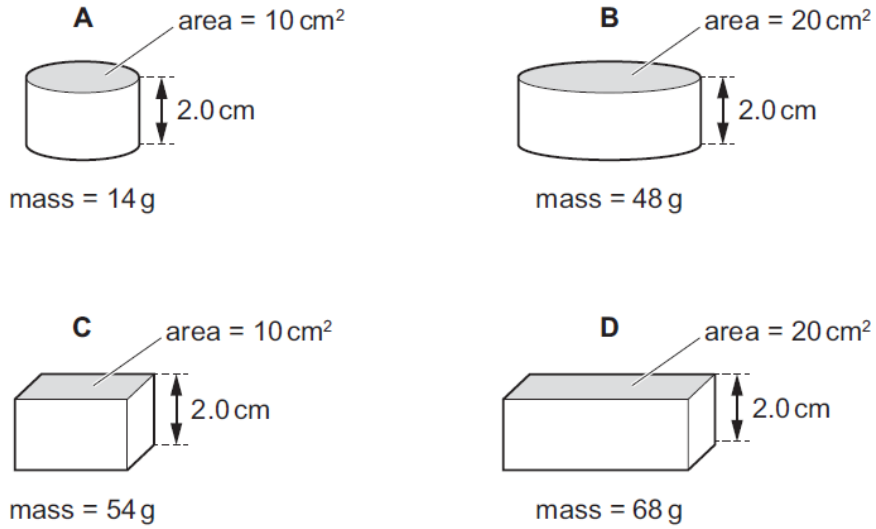


Q4. Brownian motion is observed when using a microscope to look at smoke particles in air. What causes the smoke particles to move at random?
A. Smoke particles are hit by air molecules.
B. Smoke particles are moved by convection currents in the air.
C. Smoke particles have different weights and fall at different speeds.
D. Smoke particles hit the walls of the container.

Q5. Six small compasses are placed around a bar magnet. Which diagram shows the directions in which the compass needles point?



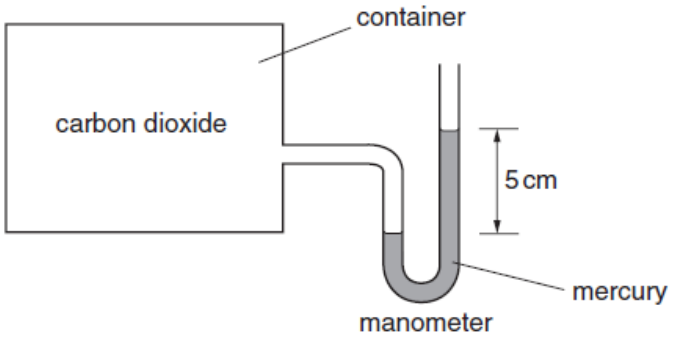
Q6. The diagrams show four solid blocks with their dimensions and masses. Which block has the greatest density?



Q7. Gas molecules striking a container wall cause a pressure to be exerted on the wall. Which statement explains this?

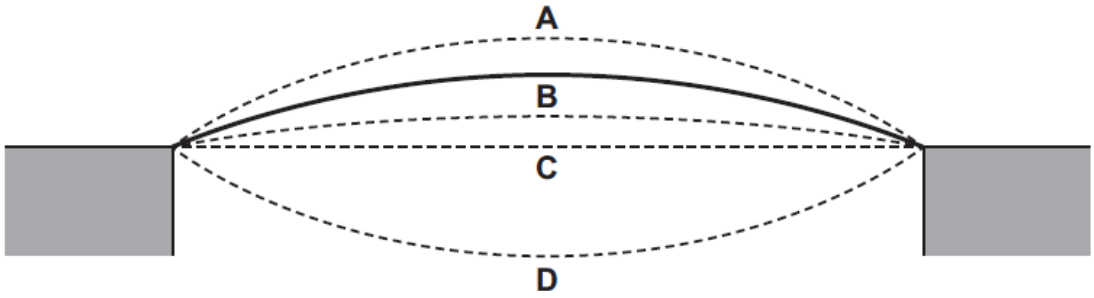
A. When a molecule rebounds there must be a change in its energy.
B. When a molecule rebounds there must be a change in its momentum.
C. When a molecule rebounds there must be a change in its speed.
D. When a molecule rebounds there must be a change in its temperature.

Q8. The diagram shows a manometer connected to a container of carbon dioxide. Which statement correctly describes the pressure exerted by the carbon dioxide?



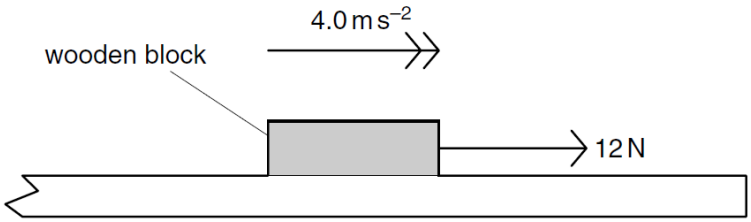
A. It is equal to the atmospheric pressure.
B. It is equal to 5 cm of mercury.
C. It is equal to 5 cm of mercury above atmospheric pressure.
D. It is equal to 5 cm of mercury below atmospheric pressure.

Q9. The diagram shows a metal foot bridge located in the Sahara desert where the temperature is much less at night than during the day. The ends of the bridge are firmly fixed to the sides of a narrow valley. The solid line shows the bridge during the coldest part of the night. Which dotted line shows the bridge at the hottest part of the day?



Q10. If the frequency of a sound wave is doubled, what happens to its wavelength, assuming the speed of sound remains constant?
A. It remains the same
B. It becomes half
C. It becomes half
D. It becomes twice as long

Q11. A wooden block of mass 0.60 kg is on a rough horizontal surface. A force of 12 N is applied to the block and it accelerates at 4.0 m/s^2. What is the magnitude of the frictional force acting on the block?

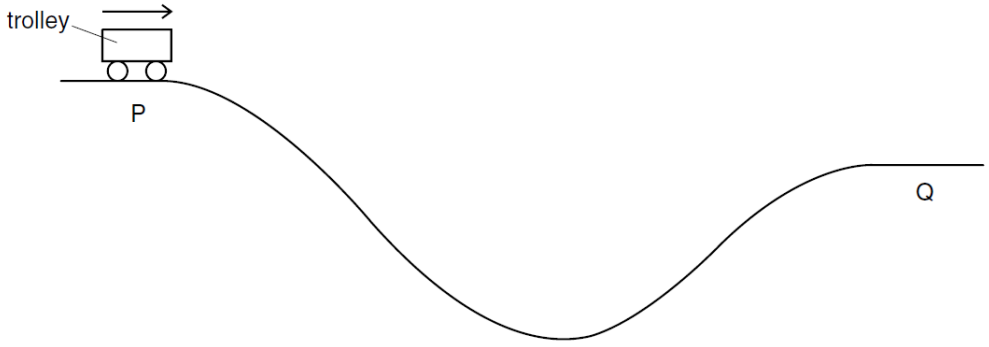


A. 2.4 N
B. 9.6 N
C. 14N
D. 16 N

Q12. A visitor to a fairground throws a soft object of mass 0.12 kg at a coconut of mass 0.48 kg. The soft object stops moving when it hits the coconut. To dislodge the coconut, it must move at a speed of 0.10 m/s. What is the minimum speed with which the visitor should throw the soft object?
A. 0.20 m/s
B. 0.40 m/s
C. 2.0 m/s
D. 4.0 m/s

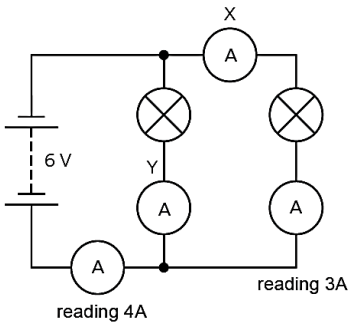
Q13. A car of mass 1500 kg has a speed of 20 m/s. It accelerates until its speed is 25 m/s. What is the increase in the kinetic energy of the car?
A. 19 kJ
B. 38 kJ
C. 169 kJ
D. 340 kJ

Q14. A trolley runs from P to Q along a track. At Q its potential energy is 50 kJ less than at P. At P, the kinetic energy of the trolley is 5 kJ. Between P and Q the work the trolley does against friction is 10 kJ. What is the kinetic energy of the trolley at Q?



A. 35 kJ
B. 45 kJ
C. 55 kJ
D. 65 kJ

Q15. The readings on two of the ammeters are labelled below. What are the readings on the ammeters X and Y?



A. X = 4 A, Y = 1 A
B. X = 1 A, Y = 3 A
C. X = 3 A, Y = 1 A
D. X = 3 A, Y = 4 A

OPEN-ENDED QUESTIONS

Q16.

(a) Two students record the mass and volume for a small cube of iron and a small cube of copper. Table 16.1. shows the results.

	Mass (kg)	**Volume (m^3)**
Iron	1.728	0.00216
Coper	1.126	0.00125

Table 16.1.

(i) Calculate the density in kg/m^3 for iron and copper.

Density of iron = ... kg/m^3

Density of copper = ... kg/m^3

[4]

(ii) Which of the two materials is less dense?

..... [1]

(iii) Which of the two cubes has less weight?

..... [1]

(b) How would you find the volume of the metal cubes?

.....

.....

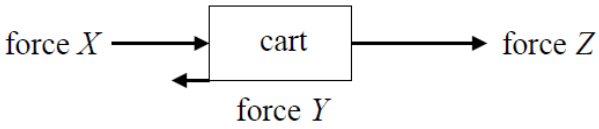
..... [3]

[Total: 7]

Q17.

(a) A cart becomes stuck in a river bed. A group of people gets it moving again. Some of them push and some of them pull.

The diagram shows the horizontal forces which act on the cart.



(i) Complete the sentences.

The frictional force is force .....

The pushing force is force ..... and the pulling force is force ..... **[1]**

(ii) Forces are vectors. How does the diagram show this?

.....

..... **[1]**

(iii) Force *U* is the unbalanced force which acts on the cart. Complete the equation for force *U* in terms of *X*, *Y* and *Z*.

U = ... **[1]**

(b) A cart has a mass of 1500 kg. An unbalanced force of 1125 N acts on the cart in an easterly direction. Calculate the acceleration of the cart and state its unit and direction.

Acceleration = ... [4]

[Total: 7]

Q18. Coal-fired power stations provide electricity for homes and industry. A government decides to replace a coal-fired power station with a hydroelectric power station.

(a) Describe how electrical energy may be obtained from the gravitational potential energy of the water behind a hydroelectric dam.

.....

.....

.....

.....

…..... [3]

(b) Apart from cost, state two advantages of generating electricity using a hydroelectric power station compared with using a coal-fired power station.

1. .....

2. .....

[2]

(c) Apart from cost, state two disadvantages of generating electricity using a hydroelectric power station compared with using a coal-fired power station.

1. .....

2. .....

[2]

[Total: 7]

Q19. (a) Figure 19.1 shows the displacement of particles in a water wave.

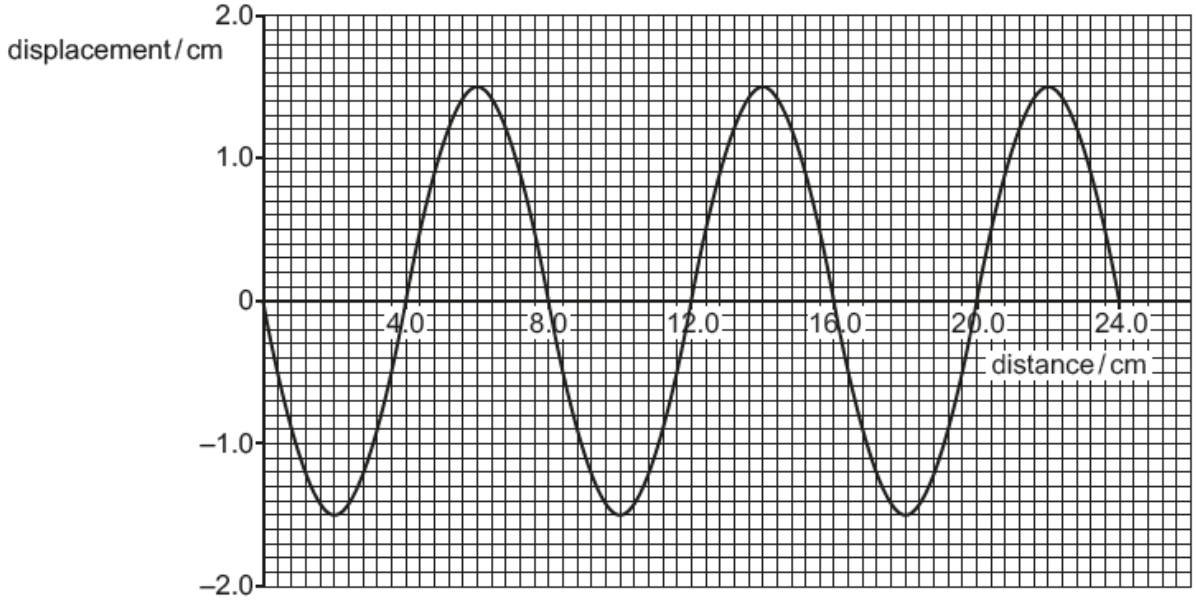


Fig. 19.1

Using the information in Fig. 19.1, determine:

(i) the wavelength of the wave

wavelength = ... cm [1]

(ii) the amplitude of the wave.

amplitude = ... cm [1]

(b) The water waves travel from deep water into shallow water. The water waves have a lower speed in the shallow water.

Fig. 19.2 shows wavefronts for the waves in deep water to the left of the boundary.

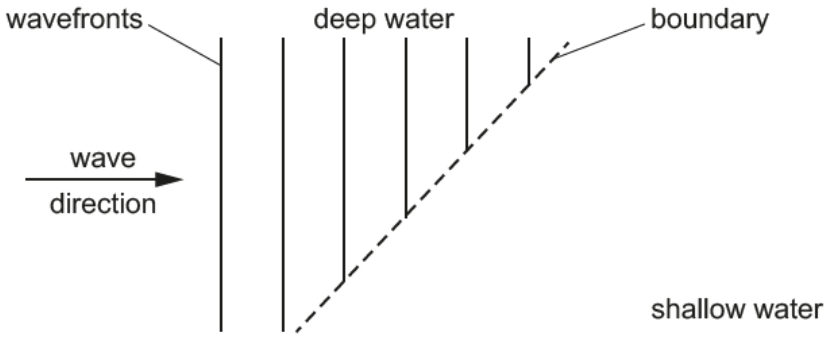


Fig. 19.2

(i) On Fig. 19.2, complete three wavefronts for the waves in shallow water to the right of the boundary. [2]

(ii) State the term for the process at the boundary in Fig. 7.2.

..... [1]

(c) (i) State the name of one type of electromagnetic wave with a wavelength shorter than that of visible light.

..... [1]

(ii) State one use of the type of wave you have given in (c)(i).

..... [1]

[Total: 7]

Q20. A student investigates the extension of a spring and uses it to determine the weight of a metre rule. The spring is shown full size in Fig. 20.1 and Fig. 20.2.

Fig. 20.1 shows the spring without any load.

Fig. 20.2 shows the spring with a load of 1.0 N suspended from it.

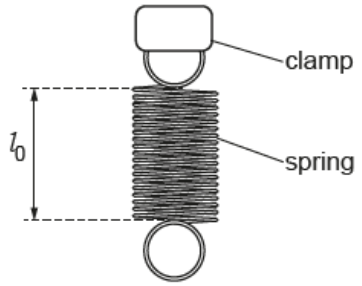


Fig. 20.1.

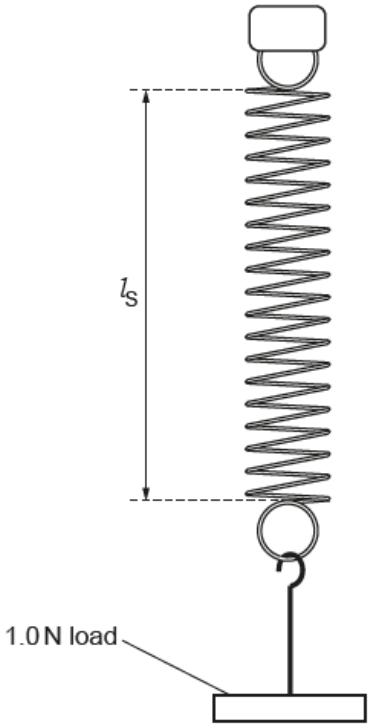


Fig. 20.2

(a) On Fig. 20.1, measure the length l_0 of the spring without any load.

l_0 = ... cm

On Fig. 20.2, measure the stretched length l_S of the spring.

l_S = ... cm

[2]

(b) The student attaches a metre rule to the spring with a wire hook, as shown in Fig. 20.3. The scale of the metre rule faces upwards.

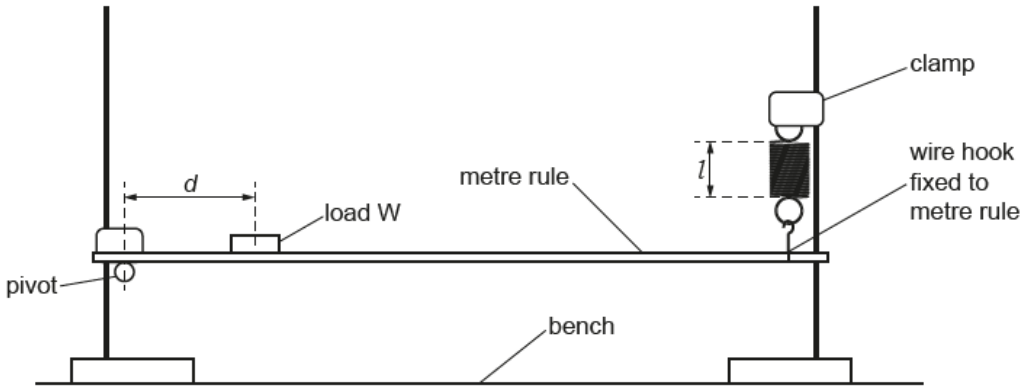


Fig. 20.3

She ensures that the metre rule is horizontal.

Briefly describe how to check that the rule is horizontal. (You may draw a diagram if it helps to explain your answer.)

.....

.....

.....

.....

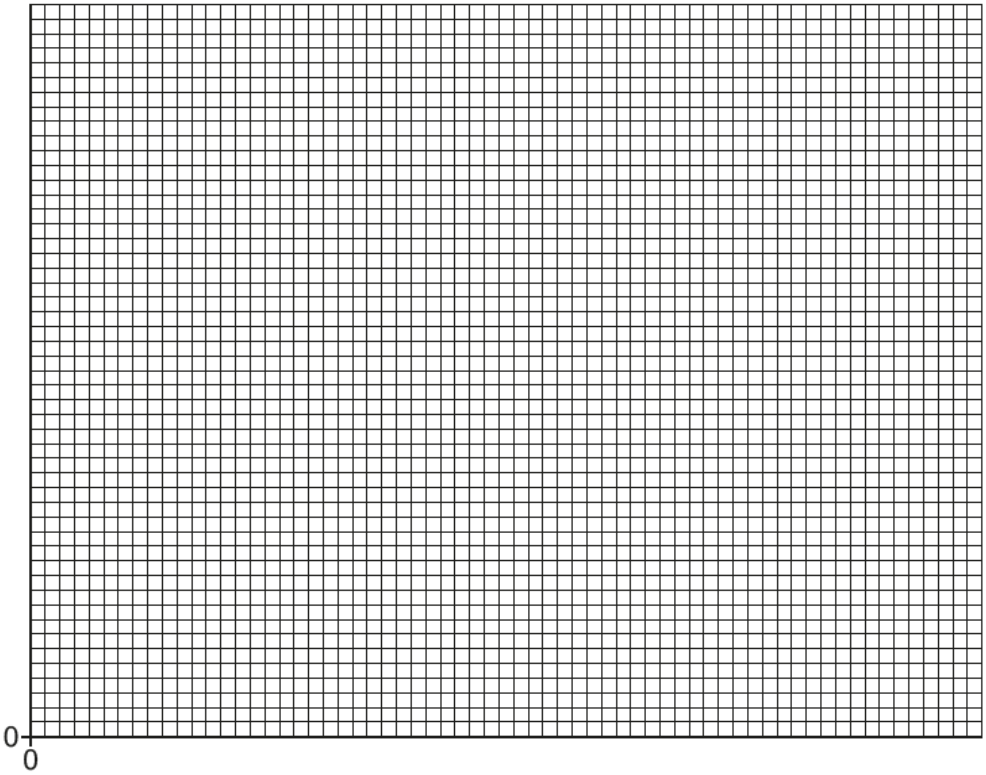
..... [2]

(c) The student moves load W to distances d = 20.0 cm, d = 30.0 cm, d = 40.0 cm, d = 50.0 cm and d = 60.0 cm from the pivot. She reads the length l of the spring for each value of d. Her readings are shown in Table 20.1.

d/cm	l/cm
20.0	6.2
30.0	7.1
40.0	7.6
50.0	8.3
60.0	9.0

Table 20.1

(i) Using the values from Table 20.1, plot a graph of l/cm (y-axis) against d/cm (x-axis). Start the axes at the origin (0,0).



[4]

(ii) From your graph, determine L, the value of l when d = 0.0 cm.

L = ... [1]

(iii) Calculate W_R, the weight of the metre rule, using your value of L from **(c)(ii)**, the values of l_0 and l_s from **(a)** and the equation

$$W_R = \frac{2(L - l_0)}{(l_S - l_0)} \times k$$

where k = 1.0 N.

W_R = ... [1]

(d) (i) It is sometimes difficult to position the load W on the scale of the metre rule at the correct distance d from the pivot.

Suggest one change to the apparatus to overcome this difficulty.

.....

..... [1]

(ii) Suggest one possible source of inaccuracy other than the difficulty described in (d)(i).

Assume that the experiment is carried out carefully.

.....

..... [1]

[Total: 12]

ANSWER KEY

Q	
1.	D
2.	D
3.	D
4.	A
5.	A
6.	C
7.	B
8.	C
9.	A
10.	C
11.	B
12.	B
13.	C
14.	B
15.	B

Q16.

(a)(i) $d_i = m/V = 1.728kg/0.00216m^3 = 800\ kg/m^3$

$d_c = m/V = 1.126kg/0.00125m^3 = 900.8\ kg/m^3$

(ii) iron

(iii) Copper cube (since it is lighter/has less mass)

(b) Volume can be found by dividing mass of the cube by its density.

Q17.

(a) (i) Y, X, Z

(b) (ii) by using arrows which have size and direction

(iii) X+Z-Y

(b) $a = F/m = 1125N/1500kg = 0.75\ m/s^2$

Q18.

(a)any three from: (moving) air has kinetic energy OR wind has kinetic energy (moving) air / wind turns turbine/blades turbine turns generator (rotating) generator produces/generates electricity

(b)any two from: (wind is) renewable (energy source) no greenhouse gases / CO_2 produced (during operation) no SO_2 OR acidic gases produced (during operation) OR no nitrous oxides produced

(c)any two from: large(r) area of land needed OR dilute energy source intermittent/inconsistent/unreliable supply OR cannot work if wind too strong/weak (possible) harm to (migrating) birds difficult to maintain (particularly if off-shore)

Q19.

(a) (i)8.0 (cm)

(b) (ii)1.5 (cm)

*(b) (i)wavefronts at different angle to boundary wavefronts towards left **AND** all with smaller wavelength (ii)refraction*

*(c)(i)ultraviolet **OR** X-rays **OR** gamma rays (ii)correct use for wave in (c)(i)*

Q20.

(a)l_0 = 2(.0) cm and l_s = 6.2 cm (both to 1 decimal place)

(b)suitable method e.g. measure distance from bench at each end and check equal

(c)(i)graph:

- *axes labelled with quantity and unit*
- *appropriate scales (occupying at least ½ grid)*
- *plots all correct to ½ small square and precise plots*
- *line well-judged and thin and extended to axis*

(c)(ii)L read correctly from graph

(c)(iii)W_R in range 1.3 to 1.6 and with unit of N

(d)(i)suspend load from loop of thread / any other suitable method to avoid standing load over marks on rule

(d)(ii)valid source of uncertainty e.g. test load not exactly 1.0 N / spring extension not linear / metre rule not uniform