Pearson Edexcel

Additional Assessment Materials Summer 2021

Pearson Edexcel GCSE in Physics (1PH0) Foundation

Resource Set Topic H – Test 2: Particle model, Forces and Matter

Questions

(Public release version)

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

7 (a) The graph in Figure 14 shows the variation in atmospheric pressure with the height above sea level.

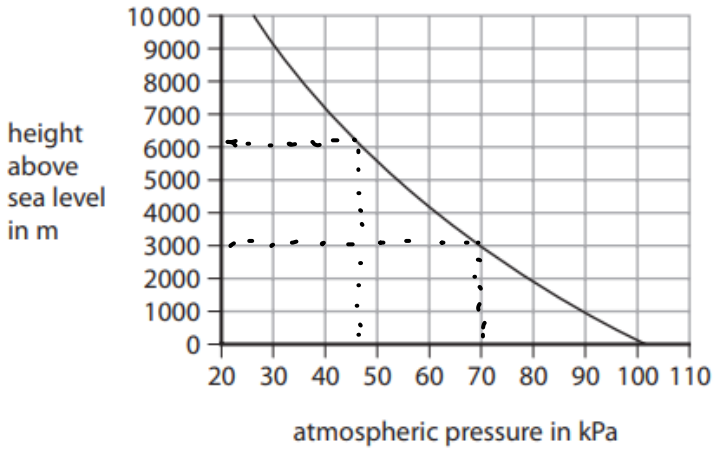

Figure 14

(i) Use the graph to estimate the atmospheric pressure at 3000 m above sea level.

(1)

atmospheric pressure = 70 kPa

(ii) Use the graph to estimate the atmospheric pressure at 6000 m above sea level.

(1)

atmospheric pressure = 48 kPa

(iii) Suggest a reason why the atmospheric pressure decreases with height above sea level.

(1)

The atmosphere gets less dense and has fewer molecules

(b) Figure 15 shows different water levels in two similar water containers with taps.

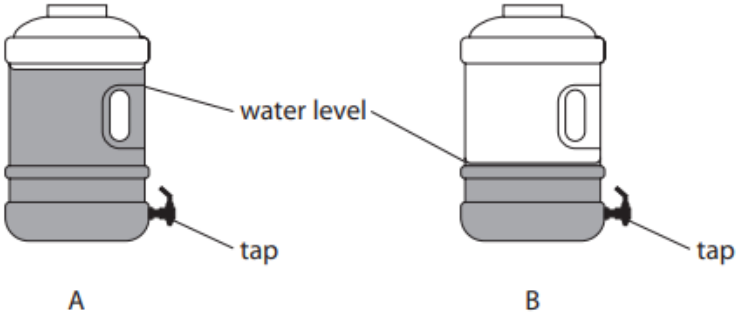

Figure 15

Explain why the water runs out of the tap of container A faster than out of the tap of container B.

(2)

The pressure exerted by the water column above the bottom of the water container floor is higher as the height of the water is higher.

(c) 10 m of sea water exerts the same pressure as the atmosphere.

A submarine is at a depth of 50 m below the surface of the sea.

Calculate how many times greater the pressure is on the submarine than atmospheric pressure.

(2)

$\frac{50}{10} + 1$

pressure = 6 times greater

*(d) Figure 16 illustrates an effect that can be explained using the ideas of pressure, force and area.

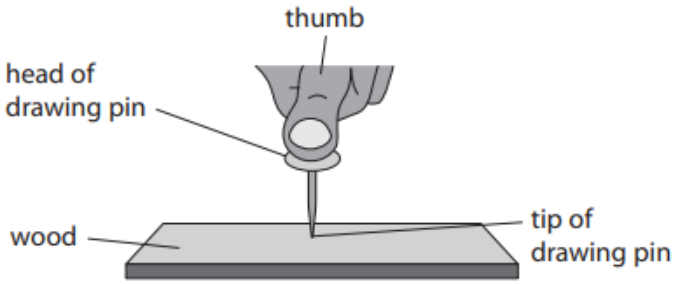

Figure 16

Explain why the tip of the drawing pin goes into the wood but the head of the drawing pin does not go into the thumb.

(6)

The same force is present in the head and the tip of the pin. However, the surface area of the head is larger compared to the the tip. Since pressure is the ratio of force and the surface area, the pressure is less at the head compared to the high pressure in the tip. The pressure in the tip is sufficient to make it go into the wood but not sufficient at the head for it to go into the thumb.

2 (a) Figure 3 shows a diver swimming in a lake.

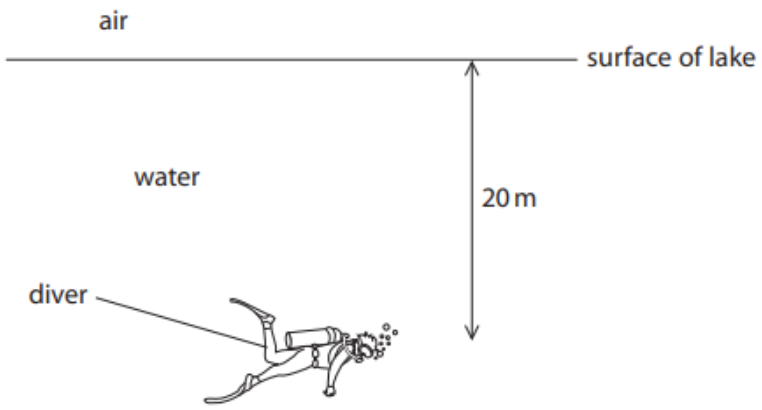

Figure 3

The pressure on the diver is due to both the water above him and the Earth's atmosphere.

The pressure of air on the surface of the water is one atmosphere.
10 m of water is equivalent to one atmosphere.

How many atmospheres of pressure will be on the diver at a depth 20 m?

(1)

- ☐ **A** 1
- ☐ **B** 2
- ☒ **C** 3
- ☐ **D** 4

(b) A balloon is filled with helium when it is on the ground.

The balloon is released and it rises through the atmosphere.

Explain what happens to the size of the balloon as it rises through the atmosphere.

(3)

The balloon expands as at higher heights, the atmospheric pressure is low. Since the balloon has air at a higher pressure compared to outside, the molecules inside the balloon exert a larger force causing the balloon to expand.

(c) Figure 4 shows a container of length 6.0 m and width 2.0 m resting on a floor.
The weight of the container is 15 000 N.

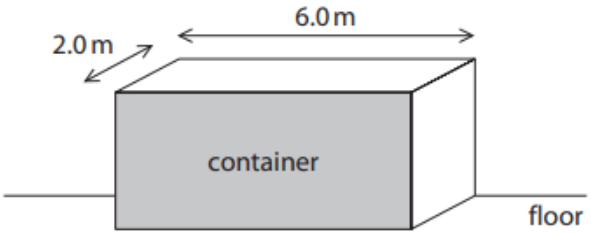

Figure 4

Calculate the pressure that the container exerts on the floor.

Use the equation

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

(3)

$A = \ell \times b$

$= 2 \times 6$

$= 12\ m^2$

$= \frac{15000}{2 \times 6} = \frac{15000}{12}$

pressure of the container on the floor = 1250 Pa

5 (a) Figure 9 shows a 10 N weight hanging from a spring.

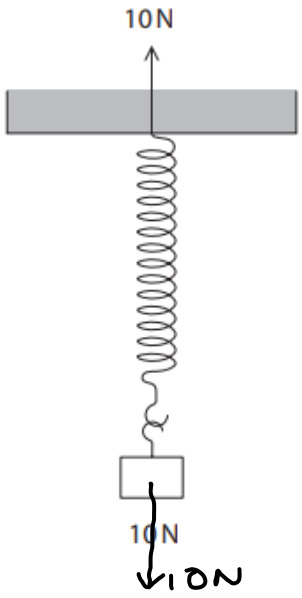

Figure 9

One of the forces acting to stretch the spring is shown in Figure 9.

Complete Figure 9 by adding an arrow to show the other force acting to stretch the spring.

(2)

(b) A weight of 4.0 N is used to extend a spring.
The extension of the spring is 0.06 m.

(i) Calculate the spring constant, *k*, of the spring.

Use the equation

$$F = k \times x$$

(3)

$4 = K \times 0.06$

$K = \frac{4}{0.06} = 66.66 \approx 66.7$

spring constant = 66.7 N/m

(ii) State what measurements should be made to determine the extension of the spring produced by the 4.0 N weight.

(2)

Initial length of the spring prior to adding the 40N

The final length of the spring after adding the 40N

(c) Another spring has a spring constant of 250 N/m.

Calculate the work done in stretching the spring by 0.30 m.

State the unit.

Use the equation

$$E = ½ \times k \times x^2$$

(3)

$$= \frac{1}{2} \times 250 \times (0.3)^2$$

$$= \frac{1}{2} \times 250 \times 0.09$$

$$= 11.25 \approx 11.3$$

work done in stretching the spring = 11.3 unit J

1 (a) Figure 1 shows an object under the surface of the sea.

(i) Which arrow shows where the pressure on the object is greatest?

(1)

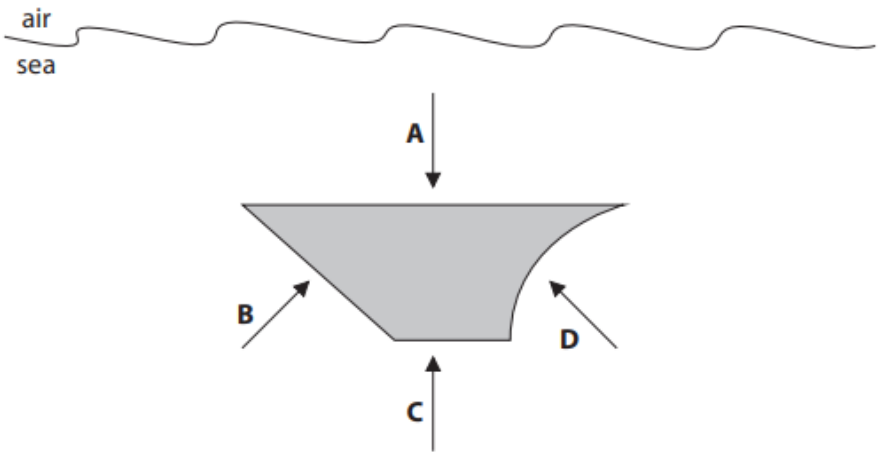

Figure 1

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(ii) Figure 2 shows two blocks of stone resting on the bottom of the sea.

Both blocks have the same height.

Area Y is 4 times bigger than area X.

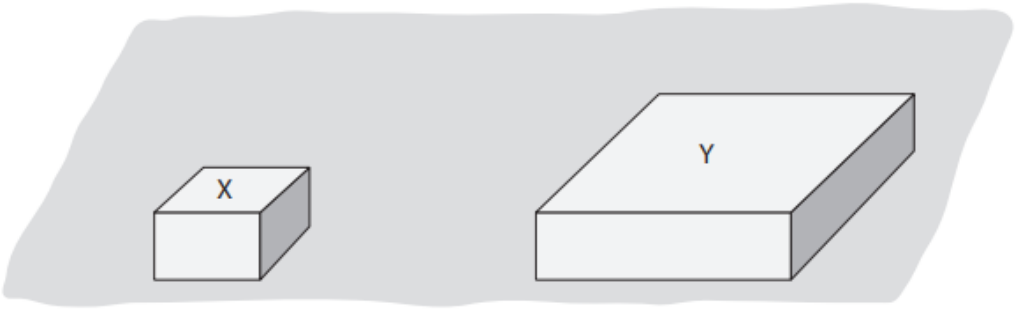

Figure 2

What is the pressure due to the water on the top surface of block Y?

(1)

- ☐ **A** one quarter of the pressure on X
- ☒ **B** the same as the pressure on X
- ☐ **C** twice the pressure on X
- ☐ **D** four times the pressure on X

(b) A diver is swimming underwater in a lake.

The diver wears the meter shown in Figure 3.

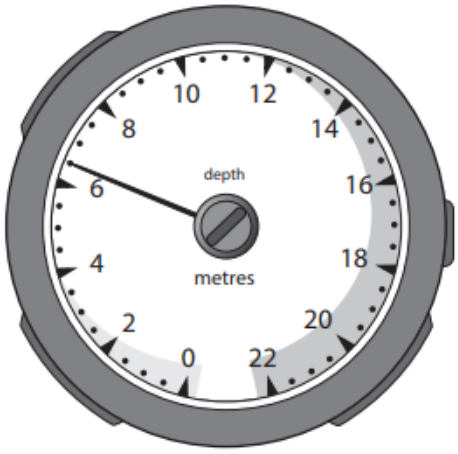

Figure 3

(i) The meter shows the depth of the diver below the surface of the water.

State the depth shown on the meter in Figure 3.

State the unit.

(2)

depth = 6.5 unit = m

(ii) State how the pressure of the water on the diver changes as the diver swims down from the surface of the lake.

(1)

It increases

(iii) State why the total pressure on the diver is greater than just the pressure due to the water above the diver.

(1)

Additional pressure due to the atmosphere is present

(c) An aeroplane takes off from the ground.

State **two** factors that affect the pressure of the atmosphere on the aeroplane as the aeroplane goes higher in the atmosphere.

(2)

1 Number of air molecules in the atmosphere per unit volume

2 The type of air molecules (weight of them) present in the atmosphere

4 Figure 10 shows a toy used to launch a ball.

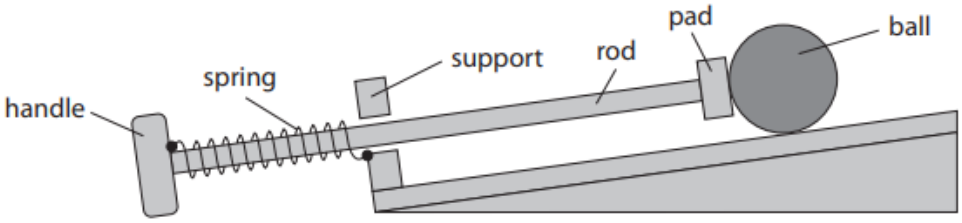

Figure 10

One end of the spring is fixed to the handle.

The other end of the spring is fixed to the support.

(a) A child pulls the handle, stretching the spring.

Figure 11 shows the toy with the spring stretched.

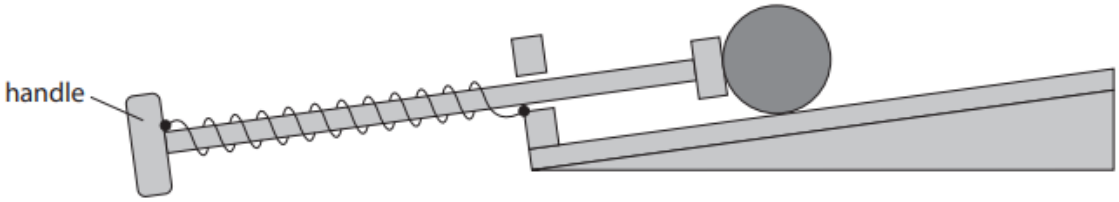

Figure 11

(i) Which of these shows the forces acting on the handle when the child keeps the spring stretched?

Ignore the force due to gravity.

(1)

☒ **A** ☒ **B** ☒ **C** ☒ **D**

(ii) In Figure 11, the extension of the spring is 0.070 m.

The spring constant (k) is 20 N/m.

Calculate the force used to extend the spring.

Use the equation

force = $k \times$ extension

(2)

$= 20 \times 0.070$

force = 1.4 N

(b) The child pulls the handle until the pad is against the support as shown in Figure 12.

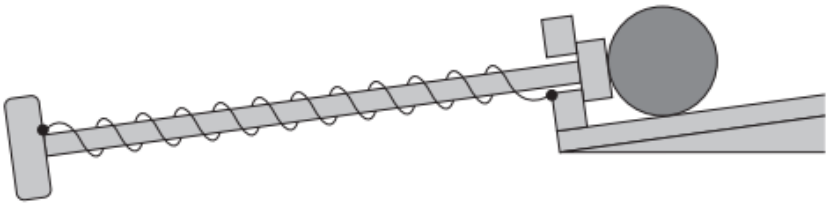

Figure 12

(i) The extension of the spring is 0.09 m.

The spring constant (k) is 20 N/m.

Calculate the work done in extending the spring by 0.09 m.

Use the equation

work done = ½ $\times$ $k \times$ (extension)^2

(2)

$= \frac{1}{2} \times 20 \times (0.09)^2$

work done = 8.1×10^{-2} J

(ii) The child lets go of the handle.

The ball starts to move.

The spring returns to its original length.

Describe the energy transfer that takes place when the ball starts to move.

(2)

The loss in strain energy in the spring is gained by the ball and converted to kinetic energy

(iii) The child can only stretch the spring until the pad is pressing against the support.

Explain how the design of the toy prevents the spring from becoming damaged.

(2)

The pad ensures the spring is not extended further to ensure the limit of proportionality or breaking limit is not exceeded.

TOTAL FOR PAPER IS 47 MARKS