Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	P	H	0	1	/	1	Signature	

Paper Reference(s)

6PH01/1

Edexcel GCE

Physics

Advanced Subsidiary

Unit 1: Physics on the Go

Sample Assessment Material

Time: 1 hour 20 minutes

Materials required for examination
Nil

Items included with question papers
Nil

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
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22	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Some questions must be answered with a cross in a box (☒). If you change your mind, put a line through the box (~~☒~~) and then mark your new answer with a cross (☒).

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 22 questions in this question paper. The total mark for this paper is 80.
There are 20 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Quality of written communication will be taken into account in the marking of your responses to Questions 14, 21 and 22. These questions are indicated with an asterisk. Quality of written communication includes clarity of expression, the structure and presentation of ideas and grammar, punctuation and spelling.

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Answer ALL the questions.

For questions 1–4, select one answer from A to D and put a cross in the box (☒). If you change your mind, put a line through the box (☒) and then mark your new answer with a cross (☒).

1. Which of the following quantities is a vector?

- ☒ **A** density
- ☒ **B** mass
- ☒ **C** strain
- ☒ **D** weight

(Total 1 mark)

Q1

2. Two wires made of the same material but of different lengths and diameters are joined end to end and used to support a vertical load. If the weight of each wire is neglected, each wire must have the same

- ☒ **A** extension
- ☒ **B** strain
- ☒ **C** tensile force
- ☒ **D** tensile stress

(Total 1 mark)

Q2

3. Newton's third law tells us that

- ☒ **A** actions usually have a reaction
- ☒ **B** weight and normal contact force are always equal and opposite
- ☒ **C** moving with constant velocity is the same as being at rest
- ☒ **D** forces always arise in pairs

(Total 1 mark)

Q3

4. An athlete throws a javelin. Just as it hits the ground the javelin has a horizontal velocity component of 20 m s^{-1} and a vertical velocity component of 10 m s^{-1}. The magnitude of the javelin's velocity as it hits the ground is

- ☒ **A** 10 m s^{-1}
- ☒ **B** 15 m s^{-1}
- ☒ **C** 22 m s^{-1}
- ☒ **D** 30 m s^{-1}

(Total 1 mark)

Q4

Leave blank

In questions 5–6, which of the following statements best completes the sentence.

A decreases linearly from zero

B increases from zero to a maximum

C increases linearly from zero

D stays constant at a non-zero value

Choose the appropriate letter to indicate which statement best completes the sentence. Each answer may be used once, more than once or not at all.

5. If air resistance is neglected, the horizontal velocity component of an arrow fired from a bow ..... with distance travelled

☒ **A**

☒ **B**

☒ **C**

☒ **D**

Q5

(Total 1 mark)

6. The velocity of a ball bearing falling from rest through syrup ..... with distance fallen

☒ **A**

☒ **B**

☒ **C**

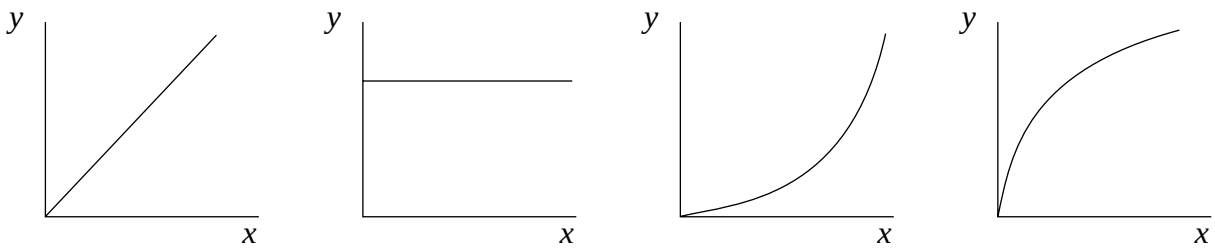
☒ **D**

Q6

(Total 1 mark)

Leave blank

In questions 7–8, which of the following graphs best represents the quantities described when they are plotted on the *y*- and *x*-axes. Each graph may be used once, more than once or not at all.



A **B** **C** **D**

	Variable on *y*-axis	**Variable on *x*-axis**
7. The kinetic energy of a car accelerating uniformly from rest		Displacement from starting position
8. The acceleration of a feather falling near to the Moon's surface		Height above the Moon's surface

7. **A** ☒ **B** ☒ **C** ☒ **D** ☒ **Q7**

(Total 1 mark)

8. **A** ☒ **B** ☒ **C** ☒ **D** ☒ **Q8**

(Total 1 mark)

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For questions 9–10, select one answer from A to D and put a cross in the box (☒). If you change your mind, put a line through the box (☒) and then mark your new answer with a cross (☒).

9. A shot putter launches the shot at an angle of 30° to the horizontal. The throw is repeated with the same launch speed, but this time at an angle of 40° to the horizontal. Which of the following is **not** correct?

☒ **A** The horizontal range is greater

☒ **B** The horizontal velocity component is increased

☒ **C** The maximum height reached is greater

☒ **D** The shot is in the air for longer

Q9

(Total 1 mark)

10. Steel can be classified as a strong material. This is because

☒ **A** it is difficult to deform

☒ **B** it has a large ultimate tensile stress value

☒ **C** it has a large Young modulus value

☒ **D** it breaks shortly after its proportional limit

Q10

(Total 1 mark)

11. Complete the gaps in the following paragraph by selecting appropriate words from the following list.

compressive density energy force mass stiff tensile tough

Increasingly, drinks containers are made out of polymers rather than glass. A container made from a polymer such as polythene has several advantages over a glass container. Polythene has low ....., and so the ..... of the container is kept low. Polythene is also ..... and so can absorb a large amount of ..... before breaking. Glass is only strong under ..... forces but polythene is also strong under ..... forces.

Q11

(Total 3 marks)

Leave blank

12. (a) Near schools the speed limit is 20 mph. It is claimed that reducing the speed limit from 30 mph (13.3 m s^{-1}) to 20 mph (8.9 m s^{-1}) halves the risk of serious injury in a car accident.

When a car is involved in a crash, the collision energy depends upon the car's speed just before impact.

(i) Determine $\frac{\text{kinetic energy of car travelling at 20 mph}}{\text{kinetic energy of car travelling at 30 mph}}$.

$\frac{\text{kinetic energy of car travelling at 20 mph}}{\text{kinetic energy of car travelling at 30 mph}}$ = ...

(1)

(ii) To what extent does your answer support the claim?

.....

.....

(2)

(b) A car of mass 1200 kg is in a crash. The front bumper of the car deforms, and the car is brought to rest from an initial speed of 10 m s^{-1} in a distance of 0.12 m.

By considering the work done on the car as it is brought to rest, calculate the average impact force that acts.

Average impact force = ...

(3)

(c) Modern cars include crumple zones to reduce the size of the impact force. Suggest how the crumple zones do this.

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(1)

Q12

(Total 7 marks)

Leave blank

13. A skydiver accelerates towards the ground at 9.81 m s^{-2} at the instant that he leaves the aeroplane.

(a) Explain why his acceleration will decrease as he continues to fall.

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(2)

(b) The skydiver opens his parachute. Explain why he reaches a terminal velocity shortly afterwards.

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(2)

(c) The velocity at which he then hits the ground is similar to that achieved when falling freely from a height of 3 m. Calculate this velocity.

Velocity = ...

(2)

Q13

(Total 6 marks)

Leave blank

*14. A sign at a railway station advises passengers to keep back from the platform edge. This is because passing trains may cause turbulence.

Explain what is meant by turbulent flow, and suggest why it is dangerous for passengers to stand near the edge of the platform.

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..... Q14

(Total 3 marks)

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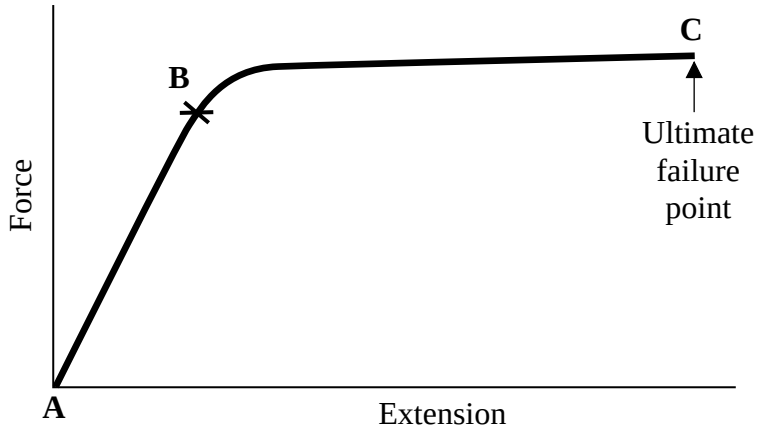
15. The graph shows how a sample of material behaves when extended by a force.



(a) What does point **B** represent?

.....

(1)

(b) State the physical property represented by the gradient of the section **AB** of the graph.

.....

(1)

(c) Explain the significance of the area underneath the line from **A** to **C**.

.....

.....

(2)

Q15

(Total 4 marks)

Leave blank

16. A raindrop has a radius of 0.70 mm. It is falling at terminal velocity through air.

(a) Show that the mass of the raindrop is approximately 1×10^{-6} kg.
Density of water = 1000 kg m^{-3}.

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(2)

(b) Ignoring any upthrust on the raindrop, calculate its terminal velocity.
Viscosity of air = 8.90×10^{-4} kg m^{-1} s^{-1}.

Terminal velocity = ...

(2)

Q16

(Total 4 marks)

Leave blank

17. A student was asked the following question: "Describe the variation in energy of a bungee jumper from the moment that the jumper is released to the lowest point that the jumper reaches." As an answer the student wrote the following:

"Initially the jumper has gravitational potential energy, which is converted into elastic potential energy as the cord stretches. At the lowest point in the jump, all of the gravitational potential energy has been converted to elastic potential energy."

(a) Discuss the student's answer, highlighting any incorrect or missing physics.

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(4)

(b) The bungee jumper has a mass of 80 kg and is in free fall through the air. At a particular instant the force of the air resistance acting on the bungee jumper is 285 N. Calculate the acceleration of the jumper.

Acceleration = ...

(2) **Q17**

(Total 6 marks)

Leave blank

18. An astronaut on the moon drops a hammer. The gravitational acceleration is 1.6 m s^{-2}.

(a) How long does the hammer take to fall 1.0 m from rest?

Time = ...

(2)

(b) Calculate the velocity of the hammer just before it hits the ground.

Velocity = ...

(2) **Q18**

(Total 4 marks)

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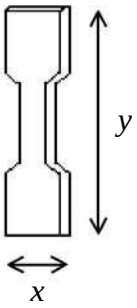
19. A tensile tester connected to a datalogger is used to investigate the effect of applying forces to a range of materials.



The sample has approximate dimensions $x = 1$ cm, $y = 10$ cm. It is fixed into the frame and force applied from a hydraulic system. The datalogger records the extension of the sample and the applied force.

(a) State any measurements, other than the force, that you would need to calculate the stress in the sample and name an appropriate instrument that you could use to make these measurements.

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(2)

(b) Explain why access to a datalogger is useful when tensile testing is carried out.

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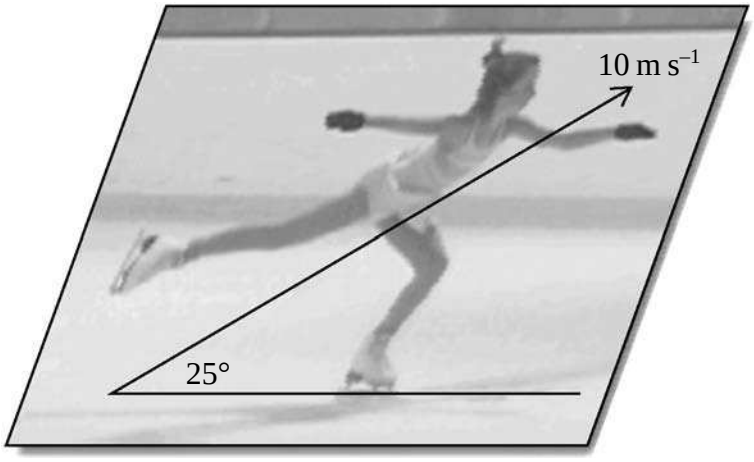
(2) **Q19**

(Total 4 marks)

Leave blank

20. Performing complex jumps is an important aspect of a figure skater's program. Jumps with great heights and jump distances tend to leave a better impression with the judges, resulting in better marks for the skater.

A skater of mass 60 kg leaves the ice with a velocity of 10 m s^{-1} at an angle of 25° to the horizontal.



(a) Show that the vertical component of the skater's velocity is approximately 4 m s^{-1}.

.....

.....

(2)

(b) Calculate the time taken to reach the top of the jump.

Time taken = ...

(2)

(c) Calculate the maximum height reached.

Maximum height = ...

(2)

Q20

(Total 6 marks)

Leave blank

*21. (a) A chest expander is used to build up the chest muscles.

One type of expander consists of five identical springs as shown. A student disconnects one spring and finds that applying a force of 6 N to it causes an extension of 5 cm.

(i) Calculate the force required to stretch a single spring by 50 cm, stating the assumption you have made.

Assumption: .....

Force = ...
(3)

(ii) Calculate the work done when all five springs are stretched by 50 cm.

Work done = ...
(2)

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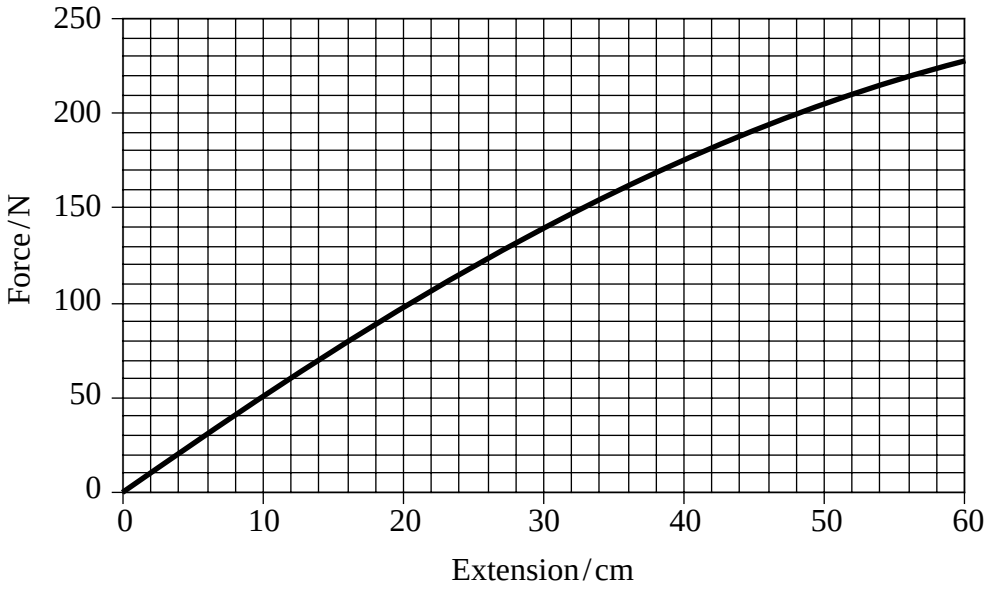
(b) A different type of chest expander uses rubber cords instead of springs. The variation of restoring force with extension for this expander is shown.



(i) Use the graph to estimate the work done in extending the expander by 50 cm.

Work done = ...

(3)

(ii) When unloading the expander, it is found that at each extension the restoring force is always less than the loading force. Explain the significance of this, and describe what effect this would have on the rubber cords when performing a large number of repetitions with the expander.

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(3)

Q21

(Total 11 marks)

Leave blank

*22. The photograph shows a climber abseiling down a rock face. At the instant shown the climber is in equilibrium.

(a) Explain what is meant by equilibrium in this context.

.....

.....

(1)

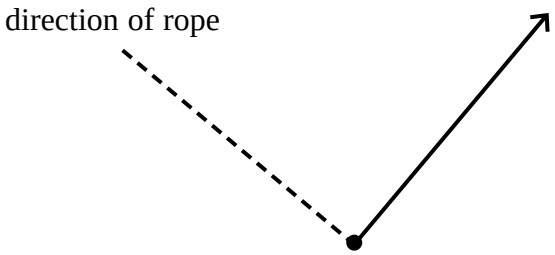
(b) The climber's mass is 65 kg. Calculate his weight.

Weight = ...

(2)

Leave blank

(c) (i) Below is an incomplete free-body force diagram for the climber.



One of the forces, which is assumed to be acting perpendicular to the rope is already shown. Label this force, and add labelled arrows to the diagram to represent the other two forces acting on the climber. Assume that the rope hanging down from the climber exerts a negligible force on him.

(3)

(ii) The rope is at an angle of 40° to the horizontal. Calculate the tension in the rope.

Tension in rope = ...

(2)

(d) The climber is wearing protective headgear in case of an accident. Describe the properties of a material suitable for the headgear, and explain why these properties are desirable.

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(4) **Q22**

(Total 12 marks)

TOTAL FOR PAPER: 80 MARKS

END