Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic : 4_Materials

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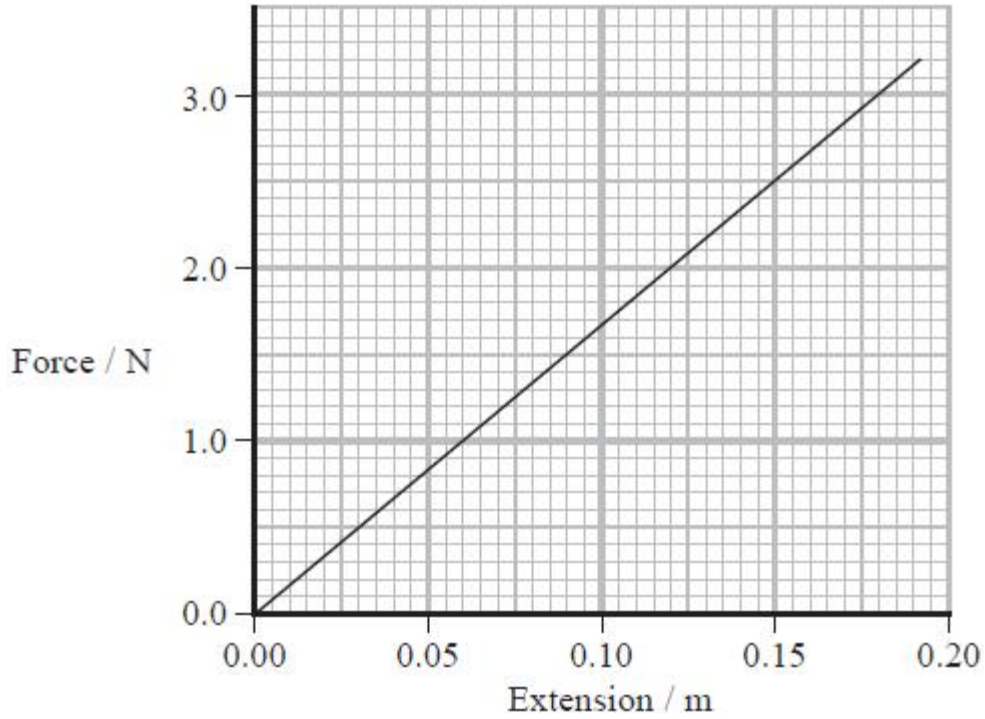
Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A force-extension graph for a spring is shown.



Which of the following gives the work done, in joules, in extending the spring by 0.15 m from its original length?

☒ **A** 0.15×2.5

☒ **B** $0.5 \times 0.15 \times 2.5$

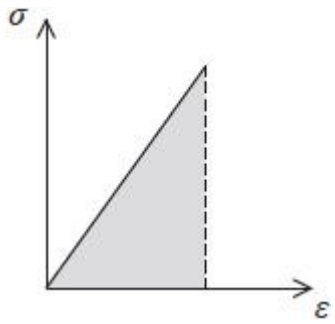
☒ **C** $\frac{2.5}{0.15}$

☒ **D** $\frac{0.15}{2.5}$

(Total for question = 1 mark)

Q2.

A force was applied across the ends of an iron bar. The following stress-strain graph was obtained.



The shaded area represents

☒ **A** $\frac{\text{work done}}{2 \times \text{volume}}$

☒ **B** $\frac{\text{work done}}{\text{volume}}$

☒ **C** $\frac{2 \times \text{work done}}{\text{volume}}$

☒ **D** work done

(Total for question = 1 mark)

Q3.

Answer the question with a cross in the box you think is correct (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

A deforming force is applied to a sample of material.

Which row of the table shows the axes of a graph for which the gradient is stiffness *k*?

	y-axis	*x*-axis
☒ **A**	extension	force
☒ **B**	force	length
☒ **C**	stress	strain
☒ **D**	strain	length

(Total for question = 1 mark)

Q4.

The viscosity of fluids varies with temperature.

Which line of the table correctly shows the change in viscosity with increasing temperature?

	Oil	Dry air
☒ **A**	decreases	decreases
☒ **B**	decreases	increases
☒ **C**	increases	decreases
☒ **D**	increases	increases

(Total for question = 1 mark)

Q5.

A sample of steel in the form of a wire is subjected to an increasing load.

Which of the following is the best description of the elastic limit of the steel?

☒ **A** The stress at which the steel undergoes an increase in strain with no increase in stress.

☒ **B** The stress beyond which the stress and strain are no longer proportional.

☒ **C** The stress beyond which the steel becomes permanently deformed.

☒ **D** The stress at which the steel breaks.

(Total for question = 1 mark)

Q6.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

When a force F is applied to a spring with stiffness k, the elastic potential energy stored is E.

What is the elastic potential energy stored when a force $2F$ is applied to a spring with stiffness $2k$?

☒ **A** $\frac{E}{2}$

☒ **B** E

☒ **C** $2E$

☒ **D** $8E$

(Total for question = 1 mark)

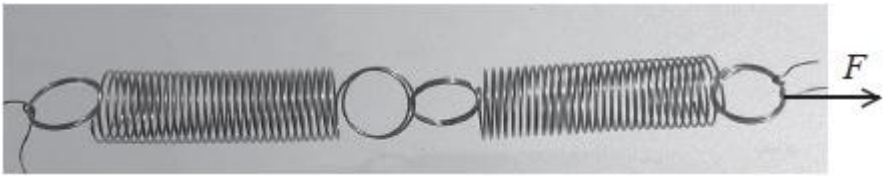
Q7.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A horizontal force *F* is applied to a horizontal spring, fixed at one end.

The stiffness of the spring is *k* and the elastic strain energy stored is *E*.

A second, identical spring is added and the same force is applied to the combination of springs, as shown.



What is the elastic strain energy stored for the combination of springs?

☒ **A** $\frac{E}{2}$

☒ **B** E

☒ **C** $2E$

☒ **D** $8E$

(Total for question = 1 mark)

Q8.

A spring obeys Hooke's law. A force of 2.0 N extends the spring by 0.30 m.

The energy stored in the spring when a force of 2.0 N is applied is

☒ **A** 0.09 J

☒ **B** 0.30 J

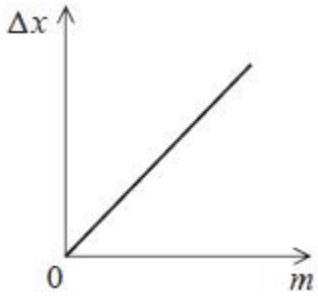
☒ **C** 0.60 J

☒ **D** 0.90 J

(Total for question = 1 mark)

Q9.

A spring is hung vertically and masses are added to the lower end.
The graph shows how the extension Δ*x* of the spring varies with the mass *m* added.



The work done in extending the spring can be expressed as

(1)

☒ **A** $mg\Delta x$

☒ **B** $\frac{mg}{\Delta x}$

☒ **C** $\frac{1}{2}mg\Delta x$

☒ **D** $\frac{mg}{2\Delta x}$

(Total for question = 1 mark)

Q10.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

A ball bearing with radius *r* falls through a fluid with density *ρ*.

Which of the following is an expression for the upthrust acting on the ball bearing?

☒ **A** $\frac{4\pi r^3 \rho}{3}$

☒ **B** $\frac{4\pi r^3 \rho g}{3}$

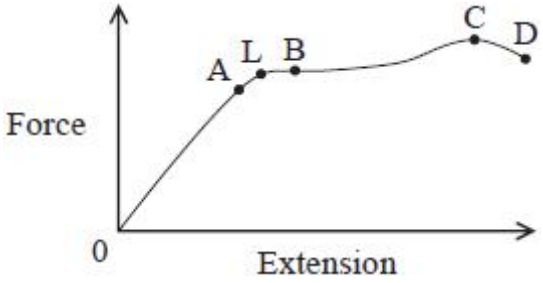
☒ **C** $\frac{4\pi r^3 g}{3\rho}$

☒ **D** $4\pi r^2 \rho g$

(Total for question = 1 mark)

Q11.

The diagram shows a force-extension graph for a wire.



L is the elastic limit.

Which point represents the yield point?

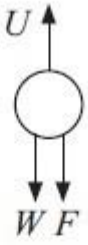
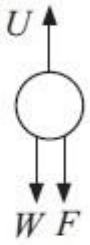
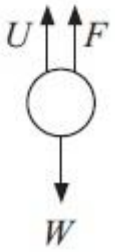
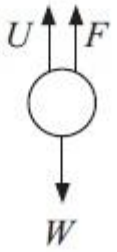
(1)

☒ **A**
☒ **B**
☒ **C**
☒ **D**

(Total for question = 1 mark)

Q12.

When beer is being brewed it can contain bubbles of gas rising through it as well as solid particles, such as grain particles, falling through it.
Which row of the table correctly shows the forces on a rising gas bubble and a falling solid particle?
F = viscous drag, *U* = upthrust, *W* = weight

	Gas bubble	Solid particle
☒ A		
☒ B		
☒ C		
☒ D		

(Total for question = 1 marks)

Q13.

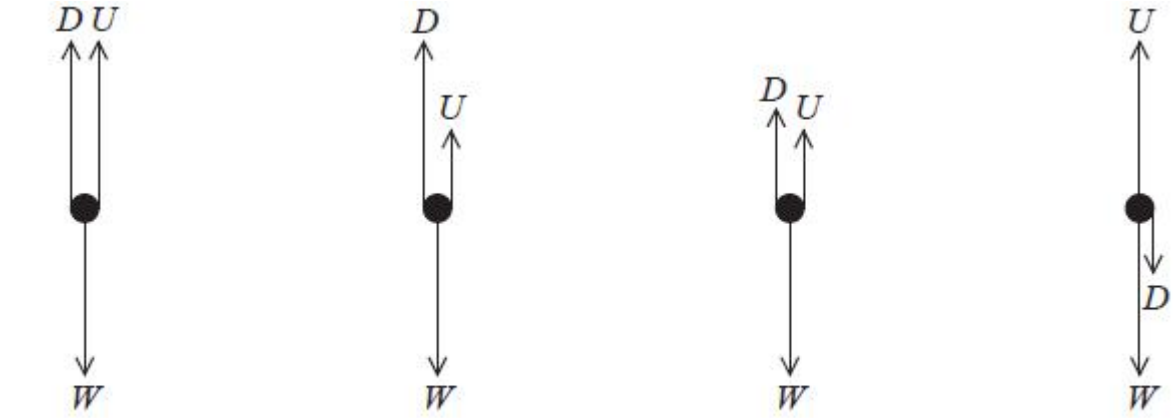
A small object is falling at terminal velocity in a large container of oil.

Which diagram correctly represents, in magnitude and direction, the forces acting on the object as it reaches terminal velocity?

W = weight

U = upthrust

D = drag



☒ **A** ☒ **B** ☒ **C** ☒ **D**

(Total for question = 1 mark)

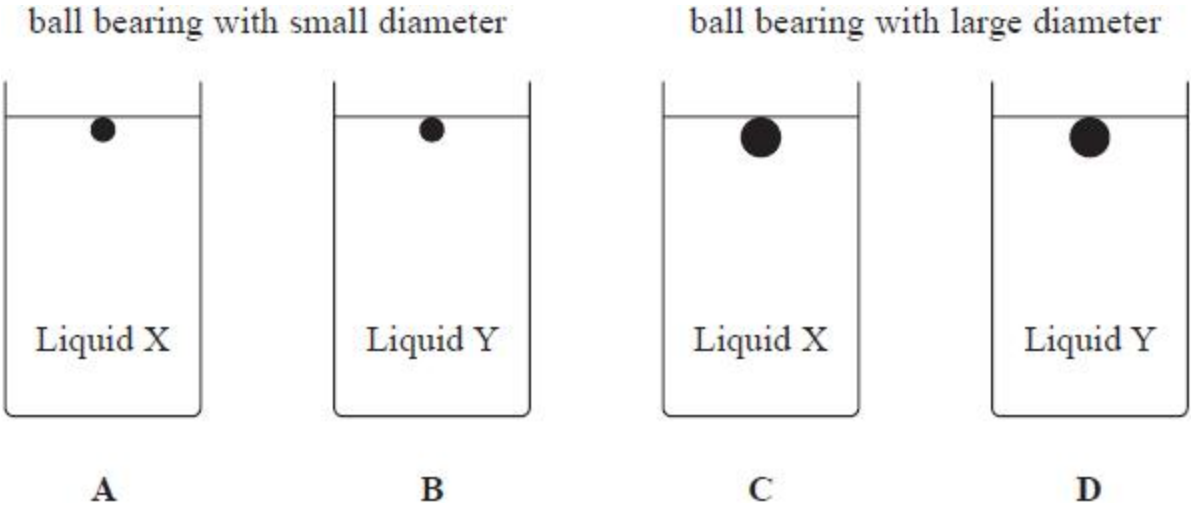
Q14.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

In a falling-ball method to investigate the viscosity of a liquid, ball bearings with two different diameters are allowed to fall through two different liquids, X and Y.

The viscosity of liquid X is greater than the viscosity of liquid Y.

In which set-up shown below will the ball bearing have the greatest terminal velocity?



☒ **A**
☒ **B**

- **C**
- **D**

(Total for question = 1 mark)

Q15.

A spring obeys Hooke's law. A force of 2.0 N extends the spring by 0.30 m.

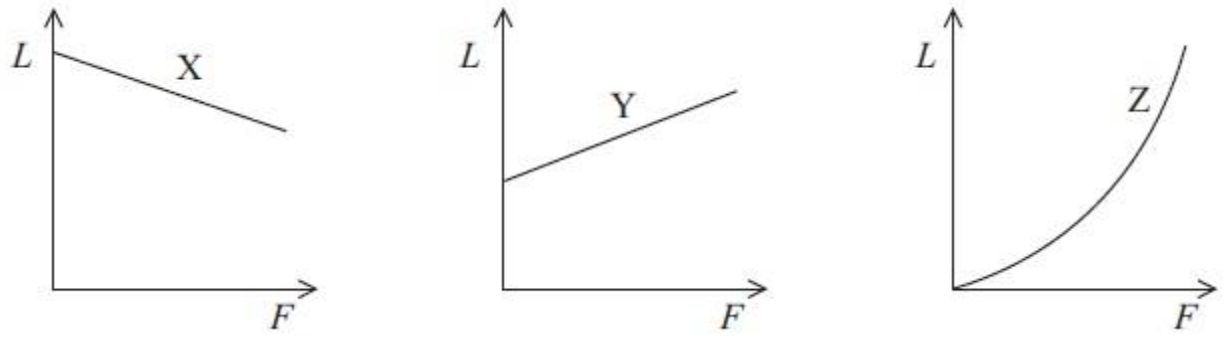
A 6.0 N force will extend the spring by

- **A** 0.10 m
- **B** 0.30 m
- **C** 0.60 m
- **D** 0.90 m

(Total for question = 1 mark)

Q16.

Three springs X, Y and Z have forces applied to them. For each spring a graph is plotted of length L of the spring against force F. The graphs are shown below:



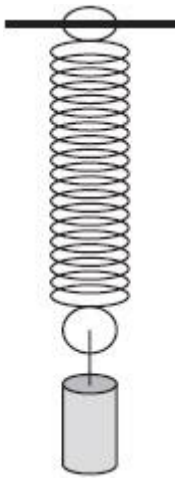
Which of the springs obey Hooke's law?

- **A** X and Y
- **B** X and Z
- **C** Y and Z
- **D** Y only

(Total for question = 1 marks)

Q17.

A spring is suspended from a bar. When a load of 6.0 N is added to the bottom of the spring, its length changes from 0.040 m to 0.13 m.



To find the spring constant of the spring you would use

$\frac{6.0\,\text{N}}{0.090\,\text{m}}$ **A** $\frac{0.13\,\text{m}}{6.0\,\text{N}}$

$\frac{6.0\,\text{N}}{0.090\,\text{m}}$ **B** $\frac{6.0\,\text{N}}{0.13\,\text{m}}$

$\frac{6.0\,\text{N}}{0.090\,\text{m}}$ **C**

$\frac{6.0\,\text{N}}{0.090\,\text{m}}$ **D** $\frac{0.090\,\text{m}}{6.0\,\text{N}}$

(Total for Question = 1 mark)

Q18.

The Hooke's law equation is:

$$\Delta F = k\Delta x$$

Which of the following gives the base units of k?

☒ **A** kg s^{-2}

☒ **B** kg m s^{-2}

☒ **C** N m

☒ **D** N m^{-1}

(Total for question = 1 mark)

Q19.

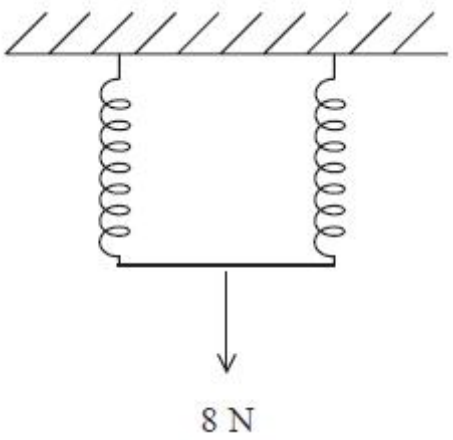
A metal wire is stretched elastically. The area under the force-extension graph for this process is equal to the

- ☒ **A** breaking stress of the wire.
- ☒ **B** elastic limit of the wire.
- ☒ **C** elastic strain energy in the wire.
- ☒ **D** Young modulus of the metal.

(Total for question = 1 mark)

Q20.

Two identical springs are suspended from a fixed support and a force applied as shown in the diagram. The spring constant of each spring is 80 N m^{-1}.



The extension of this arrangement will be

- ☒ **A** 5 cm
- ☒ **B** 10 cm
- ☒ **C** 20 cm
- ☒ **D** 40 cm

(Total for question = 1 mark)