Science Home learning

We hope you are all doing well at home, well done for doing your science work :-). Below are the email addresses for all Science staff. Do not hesitate to contact any of us with any questions. We even have twitter!

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**Lesson 5 – Forces Revision**

**Year: 10** Topic: Physics

Unit:Forces  Date Set:

Information to read / watch:

<https://www.youtube.com/watch?v=Rz4XBSKNGXg>

The whole of FORCES. AQA Physics or combined science 9-1 revision for paper 1

Tasks:

Complete ME time tasks below

Extension: Extension Task

Additional Websites:

https://www.bbc.co.uk/bitesize/topics/ztmttv4

**Forces Revision Lesson ME TIME TASK**

**Q1.**

An actor is attached to a wire so that she can hang above the stage.

Look at the figure below.



(a)     On The figure above draw two arrows to show the forces acting on the actor.

**(2)**

(b)     Which **two** forces are acting on the actor?

Tick **two** boxes.

|  |  |
| --- | --- |
| Air resistance force |  |
| Electrostatic force |  |
| Gravitational force |  |
| Magnetic force |  |
| Tension force |  |

**(2)**

(c)     The actor hangs above the stage in a stationary position.

What is the resultant force on the actor?

Resultant force = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ N

**(1)**

(d)     The actor has a mass of 70 kg.

Gravitational field strength = 9.8 N / kg

Use the following equation to calculate the weight of the actor.

Weight = mass × gravitational field strength

Give your answer to 2 significant figures.

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Weight of actor = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ N

**(2)**

(e)     A motor pulls vertically upwards on the wire with a force of 720 N.

Calculate the resultant force on the actor.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Resultant force = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ N

**(1)**

(f)     Another actor has a mass of 65 kg.

This actor is attached to the wire and the motor pulls her vertically upwards.

The resultant force on the actor is 25 N.

Write down the equation that links acceleration, mass and resultant force.

Equation \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(g)     Calculate the acceleration of the actor.

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Acceleration of actor = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m / s2

**(3)**

**(Total 12 marks)**

**Q2.**

The diagram shows a worker using a constant force of 60 N to push a crate across the floor.



My Revision Notes AQA GCSE Physics for A\* – C,
Steve Witney, © Philip Allan UK

(a)     The crate moves at a constant speed in a straight line

(i)      Draw an arrow on the diagram to show the direction of the friction force acting on the moving crate.

**(1)**

(ii)     State the size of the friction force acting on the moving crate.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ N

Give the reason for your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

(b)     Calculate the work done by the worker to push the crate 28 metres.

Show clearly how you work out your answer and give the unit.

Choose the unit from the list below.

|  |  |  |
| --- | --- | --- |
| **joule** | **newton** | **watt** |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Work done = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(3)**

**(Total 6 marks)**

**Challenge Task.**

Forces are vector quantities.

(a)  What is the difference between a vector quantity and a scalar quantity?

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**(2)**

**Figure 1** represents a wooden block being pulled across a surface at a constant speed in a straight line.

The block is in contact with the surface.

The arrow in **Figure 1** represents the tension force in the string pulling the block.

**Figure 1**

****

(b)  Complete **Figure 1** to show the other three forces acting on the block.

**(3)**

**Figure 2** is a copy of **Figure 1** to help you answer the following question.

**Figure 2**

****

(c)  **Figure 2** is drawn to scale. The scale is 1 cm : 0.5 N

Determine the horizontal and vertical components of the tension in the string.

Show these components on **Figure 2**.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Horizontal component = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ N

Vertical component = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ N

**(3)**

A student collects data on the size of the force required to pull the block across different surfaces at a constant speed.

The table below shows the results.

|  |  |  |
| --- | --- | --- |
| **Type of surface** | **Force in N** | **Mean force in N** |
| **Trial 1** | **Trial 2** | **Trial 3** |
| Cardboard | 1.4 | 1.6 | 1.5 | 1.5 |
| Carpet | 2.6 | 3.1 | 3.9 | 3.2 |
| Glass | 0.7 | 0.8 | 0.6 | 0.7 |
| Sandpaper | 5.2 | **X** | 5.3 | 5.4 |

(d)  Calculate value **X** in the table above.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**X** = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ N

**(2)**

(e)  Give **three** control variables for this investigation.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(3)**

**(Total 13 marks)**

Mark schemes

**Q1.**

(a)



*arrow pointing vertically upwards*

**1**

*arrow pointing vertically downwards*

**1**

(b)     Gravitational force

*if more than* ***two*** *boxes ticked apply list principle*

**1**

Tension force

**1**

(c)     0 (N)

**1**

(d)     weight = 70 × 9.8 (= 686)

**1**

weight = 690 (N)

**1**

*allow 690 (N) with no working shown for* ***2*** *marks*

*allow 686 (N) with no working shown for* ***1*** *mark*

(e)     34 (N) / 30 (N)

*allow ecf from 05.4 correctly calculated*

**1**

(f)     resultant force = mass × acceleration

*accept F = ma*

**1**

*accept equation correctly rearranged for a*

(g)     25 = 65 × a

**1**

a = 25 / 65

**1**

a = 0.38(4615…) (m / s2)

**1**

*allow 0.38 (m / s2) with no working for* ***3*** *marks*

**[12]**

**Q2.**

(a)     (i)     horizontal arrow pointing to the left

*judge by eye*

*drawn anywhere on the diagram*

**1**

(ii)     60 (N)

**1**

(at steady speed) resultant force must be zero

*accept forces must balance/are equal*

*accept no acceleration*

*do* ***not*** *accept constant speed*

**1**

(b)     1680

*allow* ***1*** *mark for correct substitution, ie 60 x 28 provided no subsequent step shown*

**2**

joule

*accept J
do not accept j*

**1**

**[6]**

**Challenge Task**

(a)  scalars have magnitude only

*allow size for magnitude*

**1**

vectors have magnitude and direction

**1**

(b)  any **three** from:

•   arrow pointing vertically downwards originating in the block, labelled weight

*allow gravity*

•   arrow pointing left along the surface labelled friction; part of the arrow must be between the block and the carpet

•   arrow pointing to the left touching block labelled air resistance or drag

•   arrow pointing vertically upwards from bottom surface of block, labelled (normal) contact force

*allow reaction (force) for contact (force)*

*judge horizontal and vertical by eye*

*allow 1 mark for three correctly labelled arrows, in correct directions but in incorrect positions*

**3**

(c)  clear attempt to draw horizontal **and** vertical components

*horizontal line should extend beyond dashed line on diagram*

**1**

horizontal component: 2.6 (N)

*allow a range from 2.5 to 2.7*

**1**

vertical component: 1.7 (N)

*allow a range from 1.6 to 1.8*

**1**

*if 2nd and 3rd marking points not awarded, allow* ***1*** *mark for clear measurements of* ***both*** *5.2 ± 0.2 cm and 3.4 ± 0.2 cm*

(d)  

**1**

(X =) 5.7 (N)

**1**

*allow 5.6 (N) or 5.8 (N) for* ***2*** *marks*

*an answer of 5.7 (N) scores* ***2*** *marks*

(e)  any **three** from:

•   angle (of string)

•   speed (at which block is pulled)

*allow velocity (at which block is pulled)*

•   area of block in contact with surface

•   mass / weight of block

*ignore same block*

**3**

**[13]**