# Pearson BTEC Level 1/Level 2 Tech Award

Supervised Window: Monday 13 May 2019 – Thursday 16 May 2019

Supervised hours: 2 hours

Paper Reference 21141K

# Engineering

Component 3: Responding to an Engineering Brief Set task: Part 1

Instructions for teachers

## Instructions

- Part 1 of the set task is out of 30 marks.
- This instructions for teacher's booklet is specific to each series and this material must **not** be issued to learners.
- The set task should be undertaken by learners in the period timetabled by Pearson.
- The practical demonstration, carried out by the teacher must take place immediately before the start of the supervised session and does not make up part of the two supervised hours.







Turn over 🕨



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#### Instruction for teachers

#### Part 1 Set task

Part 1 of the set task requires learners to carry out a practical activity and then complete a task and answer booklet. This must be completed in the assessment period timetabled by Pearson.

The teacher's instructions provided in this document give information on the process for the practical activity. It is the responsibility of centres to resource and trial the practical activity before it is undertaken by learners in the supervised period.

The teacher's instructions will be available for secure download from the Pearson website four weeks prior to the start of the assessment period and these must be kept secure at all times.

#### **Practical activity**

Learners must not see the teacher instructions. A separate task and answer booklet will be available for learners at the beginning of the supervised period. The set task brief provides all the necessary information for learners to conduct the practical activity and includes a table for learners to record their results and observations.

Centres will be required to supervise learners when they carry out the practical activity. However, teachers cannot provide guidance during this supervised period. Activity 1a should take approximately one hour. Activity 1b, Activity 1c and Activity 1d should also take approximately one hour.

Learners **must complete the activity independently** and record their results and observations independently. They must do this in the task and answer booklet provided. Learners will need to refer to their results and observations obtained when carrying out activities.

Learners must observe safe practice when carrying out practical activities. It is the responsibility of centres to carry out risk assessments for all practical activities.

#### Preparation of practical activity

Instructions for the preparation of the practical activity and the equipment needed will be provided for each assessment. Items should only be assembled by the teacher where this is specifically stated in these instructions.

#### Practical activity preparation and set up

The scenario is about an organisation that uses pendula. This practical activity is in two parts.

You are required to carry out a demonstration using the instructions below for learners to observe. Your demonstration must ensure that learners are aware of the appropriate health and safety procedures for this practical activity. You should remind learners they should make notes during the set up and demonstration.

You are required to fully test each aspect of the practical activity to ensure that the chosen equipment should provide valid results for your learners. You should ensure that the pivot mechanism allows the arm to swing freely.

This is a practical activity to measure the time taken for a swinging pendulum to come to rest, with and without a mass being attached.

#### List of equipment

- A flat rigid backing board e.g. a piece of MDF, hardboard or plywood. This should be approximately A3 in size and at least 3 mm thick this will hold the components upright and allow the arm to swing
- A method of holding the rigid backing board vertically e.g. supports, engineer's vice
- Angle template (provided below)
- A flat rigid arm, approximately 5 mm thick (template provided below). This must not be made from metal, as it should be a lightweight material e.g. a piece of MDF, wood or plywood
- A mass (approximately 10 grams)
- Pivot mechanism (for example M4 x 40 mm long screw and spacers/nuts as required)

   this will pass through the top hole in the arm and attaches through the backing board as shown below in the sectional view of the pivot mechanism
- Timer (for measuring time in seconds).

### Instructions for preparing the backing board

The angle template should be reproduced, using A4 paper (without scaling).

The angle template and a template for the rigid arm is located at the end of the booklet.

This template should then be securely attached to the backing board, as shown below. A hole suitable for the screw should then be drilled in the backing board, in the position indicated on the angle template drawing. A 1 mm clearance hole should then be drilled at the end of the arm, for example, a 5 mm diameter hole for a 4 mm diameter screw (see sectional view).



#### Instructions for setting up the equipment

- Temporarily attach the mass to the arm, towards the pointer as shown above.
- The mass should be attached using a method that will allow easy removal by the learner e.g. Blu Tack^ ${\ensuremath{^\circ}}$
- Assemble the pivot mechanism as shown in the sectional view below
- Ensure that the first nut holds the screw securely to the backing board
- Add sufficient nuts/spacers to prevent the arm hitting the backing board when swinging.
- Ensure that when tightening the retaining nut the arm moves freely at all times by maintaining gaps as shown below.
- Use your chosen method to hold the backing board upright.
- Check that the arm hangs vertically downwards and aligns with the vertical axis of the angle template.



#### Instructions for demonstrating the first part of the practical activity

- 1. Lift the arm so that the pointer aligns with your chosen release point.
- 2. Support the arm in this position with one finger.
- 3. Simultaneously release the arm and start the timer.
- 4. Whilst the arm swings learners should be instructed not to touch the equipment or the surface/table on which the equipment is placed.
- 5. When the arm stops swinging record the elapsed time (unintentional movement of the arm at this point; caused by vibration, air movement, etc should be ignored).
- 6. Reset the timer and repeat steps 1 5 from a different release point.
- 7. Repeat if necessary to allow all learners to view.

#### Instructions for modifying the equipment

• Carefully remove the mass from the arm, do not remove the arm from the pivot mechanism.



#### Instructions for demonstrating the second part of the practical activity

- 1. Lift the arm so that the pointer aligns with your chosen release point.
- 2. Support the arm in this position with one finger.
- 3. Simultaneously release the arm and start the timer.
- 4. Whilst the arm swings learners should be instructed not to touch the equipment or the surface/table on which the equipment is placed.
- 5. When the arm stops swinging record the elapsed time (unintentional movement of the arm at this point; caused by vibration, air movement, etc should be ignored).
- 6. Reset the timer and repeat steps 1 5 from a different release point.
- 7. Repeat if necessary to allow all learners to view.

| Angle template            |   |
|---------------------------|---|
| 190                       |   |
| Centre of pivot mechanism |   |
|                           | 9 |







Shaded circle indicates approximate position of mass