*Pre-Leaving Certificate Examination 2010*

# *Construction Studies*

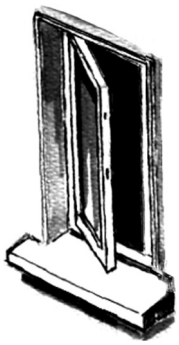
## *Theory - Higher Level*

***(300 marks)***

## *Time: 3 Hours*

***(a)*** *Answer* ***Question 1*** *and* ***four*** *other questions.*
***(b)*** *All questions carry equal marks.*
***(c)*** *Answers must be written in ink.*
***(d)*** *Drawings and sketches to be made in pencil.*
***(e)*** *Write the number of the question distinctly before each answer.*
***(f)*** *Neat freehand sketches to illustrate written descriptions should be made.*
***(g)*** *The name, sizes, dimensions and other necessary particulars of each material indicated must be noted on the drawings.*

**1.** This sketch shows a double-glazed hardwood window fitted in a cavity wall of a new building. The wall is 350 mm concrete block external wall with an insulated cavity. The wall is plastered on both sides.



**(a)** To a scale of 1:5, draw a vertical section through the wall, showing the head and cill detail for the double-glazed window. Include **four** typical dimensions on your drawing.

**(b)** Indicate clearly on your drawing the design detailing which ensures that moisture does not penetrate to the inner wall.

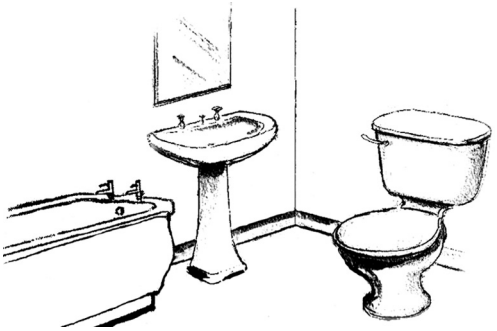
**2.** **(a)** Identify **two** possible risks to personal safety associated with **each** of the following:

- erecting a scaffold around a building
- tiling a pitched roof on a new building
- working around a stairwell on an upper floor before the stairs is fitted.

**(b)** Using notes and ***freehand sketches***, outline **two** safety precautions that should be observed to eliminate **each** risk identified at **2(a)** above.

**(c)** Working on a building site has many dangers attached. Outline **three** strategies that could help to encourage safe working practices by workers on a building site.

**3.** **(a)** Draw a neat ***single-line diagram*** of a cold water distribution system for a two-story house. The diagram should include mains supply, kitchen sink and upstairs bathroom consisting of water closet, wash-hand, basin and bath.
Include in your diagram all necessary valves and suggest suitable sizes for all pipe work.



**(b)** It is necessary to replace an old water storage tank with a new tank. Using notes and ***freehand sketches***, show clearly all necessary pipe work, fittings, insulation and supports surrounding the tank.

**4.** A house built over thirty years ago has an external cavity wall with the following specifications:

| | | |
|---|---|---|
| External cement render | thickness | 19 mm |
| Concrete block outer leaf | thickness | 100 mm |
| Uninsulated cavity | width | 100 mm |
| Concrete block inner leaf | thickness | 100 mm |
| Internal plaster | thickness | 16 mm |

***Thermal data of the external wall:***

| | | |
|---|---|---|
| Resistance of external surface | (R) | 0.048 $m^2$ °C/W |
| Conductivity of external render | (k) | 0.460 W/m °C |
| Conductivity of concrete blocks | (k) | 1.440 W/m °C |
| Resistance of cavity | (R) | 0.170 $m^2$ °C/W |
| Conductivity of internal plaster | (k) | 0.460 W/m °C |
| Resistance of internal surface | (R) | 0.122 $m^2$ °C/W |
| External temperature | (T) | 11°C |
| Internal temperature | (T) | 21°C |

**(a)** Using the data given above, calculate the U-value of the external cavity wall.

**(b)** The owner wishes to increase the insulation properties of the wall and may choose either of the following methods:

- filling the cavity with urea formaldehyde foam

  or

- fixing insulated plasterboard sheeting to the inside wall surfaces. The insulated sheeting consists of 50 mm rigid urethane and 12.5 mm plasterboard.

Calculate the U-value for **each** of the above options given the following thermal data:

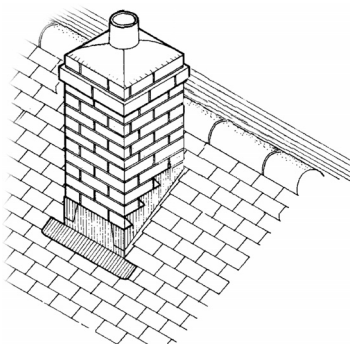
| | | |
|---|---|---|
| Conductivity of urea formaldehyde foam | (k) | 0.040 W/m °C |
| Conductivity of rigid urethane | (k) | 0.023 W/m °C |
| Conductivity of plasterboard | (k) | 0.160 W/m °C |

**(c)** Recommend a preferred method to increase the thermal properties of the wall and give **two** reasons to support your recommendation.

**5.** A concrete block chimney passes through a pitched roof as shown on the sketch.

**(a)** To a scale of 1:5, draw a vertical section through the roof. Show all the construction details at the roof and chimney intersection. Include **two** courses of slates both sides of the chimney.

**(b)** Using notes and ***freehand sketches***, show **three** design details necessary to prevent the occurrence of down draught in a chimney.



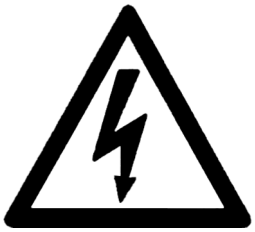
**6.** A house over one hundred years old is shown below. Although functional for its time, it now has a problem with dampness throughout the building.

**(a)** Describe **four** locations where dampness may penetrate this building.

**(b)** Using notes and ***freehand sketches*** describe how damp penetration can be eliminated at **each** location mentioned in **6(a)** above.

**(c)** List **two** materials used to prevent damp penetration in buildings at the construction stage and give **two** reasons in favour of **each** material listed.

**7.** Proper installation of electrical circuits is of great importance to safeguard people from personal injury.



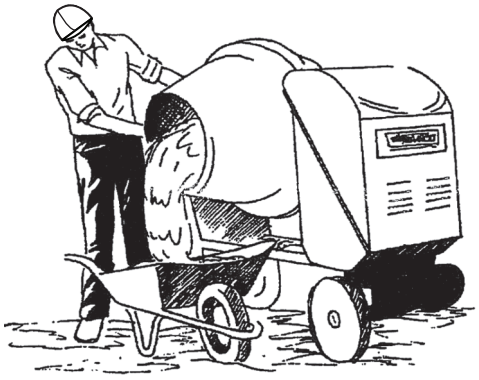
**(a)** Using notes and ***freehand sketches***, show the correct wiring for two sockets in a ring system of a domestic electrical installation.

**(b)** Explain, using notes and ***freehand sketches***, the principles of earthing in a domestic electrical installation.

**(c)** Outline **three** safety procedures when using electrically powered tools on a building site.

**8.** Modern building methods require that concrete production be of a high standard.

**(a)** Explain **any five** of the following which are used to ensure that concrete production is of a high standard.



- aggregates
- batching
- water / cement ratio
- slump test
- placing
- compacting
- curing.

**(b)** Steel is used in concrete to increase its tensile strength. Using notes and ***freehand sketches*** describe **two** methods of including steel in the manufacture of concrete lintels.

**9.** The downstairs living room of a two-storey house is to be fitted with an elaborate music system.

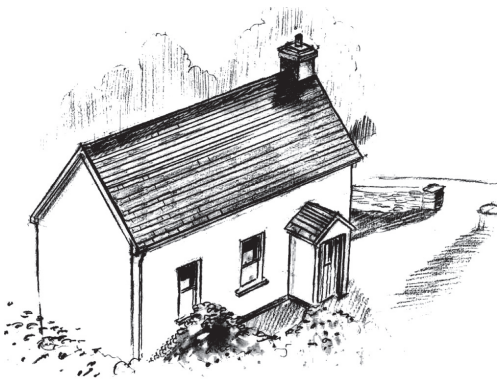
The walls and ceilings of this room have a smooth hardwall plaster finish. The laminate wood floor is laid over underlay onto a concrete base. The living room is separated from an adjacent study / office by a traditional stud partition. Renovations to improve the sound insulation of the room are to be carried out.

**(a)** Describe **two** sound insulation principles on which effective sound insulation is based.

**(b)** Using ***freehand sketches***, show **two** design details that would improve the sound insulation properties of the room.

**(c)** Using notes and ***freehand sketches***, show **two** methods of enhancing the acoustic properties of the room.

**10.** The accompanying sketch shows a bungalow dwelling in the countryside. The owners have decided to increase the energy efficiency of their home. They intend to upgrade the insulation in the house and add a conservatory to make use of natural sunlight in the area.



**(a)** Outline, using notes and ***freehand sketches***, **two** considerations to be taken into account that would help to maximise the solar gain from such a sunspace.

**(b)** Using notes and ***freehand sketches***, describe **two** methods of increasing the thermal insulation of the external walls.

**(c)** Discuss in detail **three** advantages of using thermal insulation.

**OR**

**10.** **‘‘**The suburban spread of settlements over the last decade could be viewed as having been wasteful both in terms of its impact on the existing fabric and infrastructure of towns, and in terms of continual erosion of the landscape. If this trend is to be reversed, the built fabric of towns and villages will need to be renewed, and dwellings and related facilities provided, which will attract families back to them.’’

Discuss the above statement in detail and propose **three** guidelines that would encourage the regeneration of urban areas.

***Developing a Government Policy on Architecture (1996)***

BLANK PAGE

BLANK PAGE

BLANK PAGE