



Leaving Certificate Examination, 2011

Construction Studies

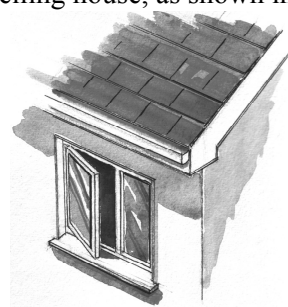
Theory - Ordinary Level

(200 marks)

Wednesday, 22 June
Afternoon, 2:00 to 4:30

- (a) Answer **Question 1** and **three** 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.*

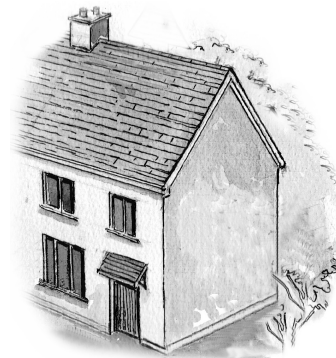
1. A triple glazed timber casement window is fixed in the external wall of a dwelling house, as shown in the sketch. The external wall is a 350 mm concrete block wall with an insulated cavity. The wall is plastered on both sides. The fixed frame of the window is 150 mm × 80 mm.



- (a) To a scale of 1:5 draw a vertical section through the top portion of the window showing the fixed window frame and the concrete lintels. Show the typical construction details from 300 mm below to a level 400 mm above the concrete lintels. Include **four** typical dimensions.

- (b) Show clearly on your drawing the flashing (dpc) and the insulation at the window head.

2. A dwelling house built 40 years ago, as shown in the sketch, has a 300 mm external concrete block wall with a 100 mm un-insulated cavity. The owner intends to refurbish the house to improve the thermal insulation levels of the external walls by:



- injecting insulation into the cavity of the external walls **and**
- fixing an internal insulation system to the external walls.

- (a) For **each** insulation system listed above, show using notes and neat freehand sketches the procedures to be followed when applying the insulation system.

For **each** system, specify the insulation material used.

- (b) Discuss **one** advantage and **one** disadvantage of **each** system of insulation.

3. A wood burning stove has a back boiler fitted to heat domestic water for a dwelling house.

- (a) Using a single-line labelled diagram, show the pipework required to supply hot and cold water to a wash hand basin and to a mixer shower in a bathroom, as shown in the sketch. Include the following in your diagram:

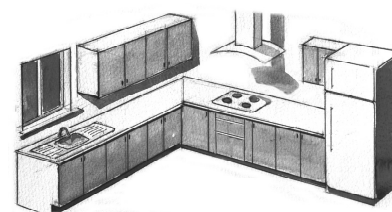
- water storage tank and overflow
- rising main
- indirect cylinder
- pipework to wash hand basin and shower
- valves and insulation.



- (b) Discuss **two** advantages of using a mixer shower as shown, which is connected to the system outlined at **3(a)** above, rather than an electric power shower.

4. The sketch shows the layout of a kitchen space. The location of the kitchen cabinets, sink, cooker and fridge is shown.

- (a) Using notes and neat freehand sketches, show **one** method of fixing the overhead cabinets to a concrete block wall so that they are both level and secure.

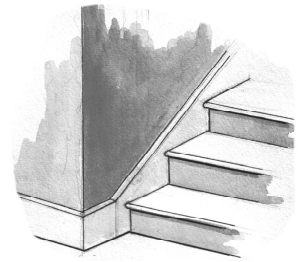


- (b) A solid wood floor is to be fitted on the existing concrete floor. Using notes and neat freehand sketches show **one** method of fitting the wooden floor. Recommend a wood suitable for a kitchen floor and give **two** reasons for your choice.

- (c) Discuss **two** advantages of locating the sink, cooker and fridge in the positions shown in the sketch.

5. The sketch shows a portion of a closed string timber stairs suitable for a dwelling house.

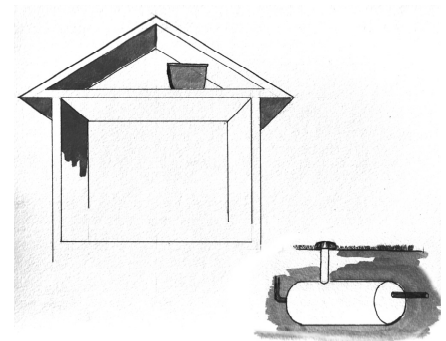
- (a) To a scale of 1:5, draw a vertical section through the bottom three steps of the stairs. Show the string, treads and risers and give their typical sizes.
- (b) Show on your drawing **one** design detail which will ensure that the stairs does not creak when in use.



6. (a) List **two** specific safety precautions to be observed in each of the following situations and give **one** reason for each safety precaution listed:
- fitting a precast concrete window cill at ground floor level in a house
 - working at height when renovating an old house.
- (b) Using notes and neat freehand sketches, describe **two** specific safety precautions that should be observed when using a wood turning lathe in school. Give **one** specific reason why each safety precaution listed should be observed.

7. The sketch shows an outline of a single storey house, an underground rainwater storage tank and a separate rainwater storage tank in the attic of the house.

- (a) Using notes and neat freehand sketches show the pipework necessary to pump the rainwater from the underground storage tank to the tank in the attic. Label the components and give their typical sizes.
- (b) Stored rainwater may be used in both a toilet and a washing machine. Show, using notes and neat freehand sketches, the pipework necessary to connect **one** of these appliances to the storage tank in the attic. Show the necessary valves.



- (c) Discuss **one** reason why the rainwater is stored in a separate storage tank in the attic.

8. Explain with the aid of notes and neat freehand sketches, any **five** of the following:

- fascia
- strip foundation
- thermostatic valve
- window board
- butt hinge
- rafter
- solar panel
- wall tie
- radon barrier.

9. The sketch shows a wooden garden seat designed for use in a public park.

- (a) Discuss, with the aid of notes and neat freehand sketches, **one** design feature that makes the seat suitable for outdoor use.
- (b) Show using notes and neat freehand sketches, a suitable method of jointing the arm rest to the back leg and discuss why the method of jointing shown is suitable.
- (c) Recommend a suitable applied finish for the garden seat. Describe using notes and freehand sketches, the steps to be followed when preparing the surface of the wood and applying the recommended finish to the garden seat.





Leaving Certificate Examination, 2012

Construction Studies

Theory - Ordinary Level

(200 marks)

Friday, 15 June
Afternoon, 2:00 to 4:30

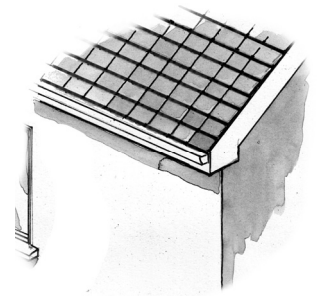
- (a) Answer **Question 1** and **three** other questions.*
- (b) All questions carry equal marks.*
- (c) Answers must be written in ink.*
- (d) Drawings and sketches to be made in pencil.*
- (e) Write the number of the question distinctly before each answer.*
- (f) Neat freehand sketches to illustrate 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. The sketch shows a tiled roof of a dwelling house, which is supported on a 350 mm external concrete block wall with an insulated cavity. The roof is a traditional cut roof and has a pitch of 45°.

(a) To a scale of 1:5, draw a vertical section through the eaves of the tiled roof and the external wall. Show the typical construction details from a level 400 mm below the wall plate, through the eaves and include **three** courses of tiles at eaves.

Include the roof insulation and show clearly the ventilation path to the roof structure at the eaves. Include **three** typical dimensions.

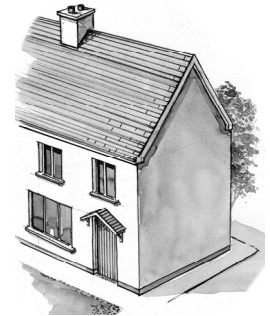
(b) On your drawing, show **one** method of closing the cavity at eaves level.



2. A dwelling house, as shown in the sketch, has a 300 mm external block wall with 50 mm expanded polystyrene insulation in the cavity. The wall has a smooth external render finish. It is proposed to improve the insulation properties of the wall by adding an external system of insulation.

(a) Using notes and neat freehand sketches, show **one** suitable method of applying an external insulation system to the wall. Specify the insulation material used, indicate its typical thickness and include details of the external surface finish to the insulation.

(b) List **two** advantages of applying an external system of insulation to the walls of an existing house.



3. A dwelling house is connected to the public water supply system to provide clean, treated water for the household.

(a) Using a single-line labelled diagram, show the pipework required to supply cold water to a kitchen sink, as shown in the sketch.

Include the following in your diagram:

- pipework from public mains to kitchen sink
- location of valves
- material and typical size of pipework.

(b) Include in your sketch **two** design details that would prevent the water in the mains supply from freezing during very cold weather.

(c) Outline **two** ways in which the household could reduce the use of treated water from the public water supply.

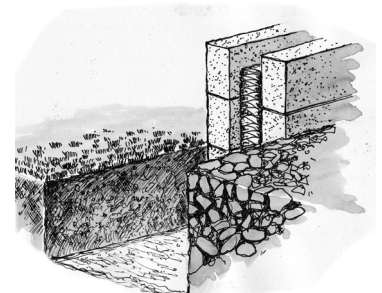


4. A strip foundation is designed to support a 350 mm external wall of a dwelling house. The wall is of concrete block construction with an insulated cavity, as shown in the sketch.

(a) Describe, using notes and neat freehand sketches, the design of a typical strip foundation for the above external wall under the following headings:

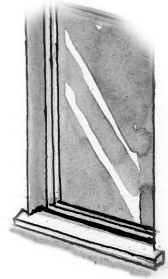
- width and depth of trench
- finished level of concrete in foundation
- reinforcement of foundation
- position of wall on strip foundation.

(b) Discuss **two** environmental reasons why a strip foundation is the preferred foundation type for the external wall of the house.



5. A triple-glazed timber casement window, as shown in the sketch, is fixed in a 350 mm external concrete block wall with an insulated cavity. The fixed frame of the window is 150 mm × 80 mm. The wall is plastered on both sides.

- (a) To a scale of 1:5, draw a vertical section through the bottom portion of the window showing the fixed frame of the window and the concrete cill. Show the typical construction details from 300 mm below to a level 250 mm above the concrete cill. Indicate the typical sizes of **three** main components.
- (b) Include in your drawing the typical design detailing that would prevent the formation of a thermal/cold bridge at the concrete cill.



6. (a) List **two** specific safety precautions that should be observed in **each** of the following situations and give **one** reason for each safety precaution listed:

- manually lifting a load from a floor
- placing concrete in a foundation trench from a ready-mix truck.

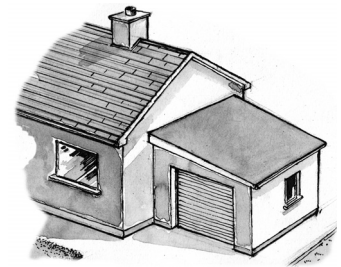
(b) Using notes and neat freehand sketches, describe **two** items of personal protective equipment that must be worn on a building site and discuss the importance of **each** item to ensure the personal safety of workers on a building site.



7. A homeowner wishes to obtain planning permission to convert an existing garage to a living room, as shown in the accompanying sketch.

- (a) Discuss **two** reasons why it is necessary to apply for planning permission to convert the garage to a living room.
- (b) Outline the information that must be contained in **each** of the following documents when making a planning application to the planning authority:

- site location map
- copy of site notice.



(c) Discuss **one** reason why a planning authority might refuse planning permission for the proposed conversion.

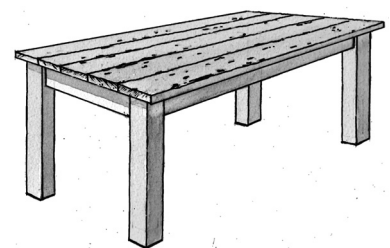
8. Explain, with the aid of notes and neat freehand sketches, any **five** of the following:

- rainwater butt
- wall tie
- newel post
- box dovetail joint
- gully trap
- through and through sawing
- compression joint
- angle bead
- biscuit joint.

9. The sketch shows a traditional dining table made from solid oak.

(a) Show, using notes and neat freehand sketches, a suitable method of jointing the front rail to the leg and discuss why the method of jointing shown is suitable.

(b) It has been decided to restore the tabletop, which has become damaged over time, as shown. Show, using notes and neat freehand sketches, the steps involved in removing the marks and in preparing the tabletop for the application of a new applied finish.



(c) Recommend a suitable applied finish for the tabletop. Describe, using notes and neat freehand sketches, the steps to be followed when applying the recommended finish.



Leaving Certificate Examination, 2013

Construction Studies

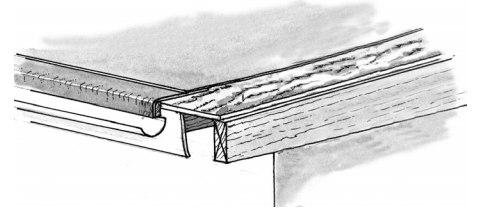
Theory - Ordinary Level

(200 marks)

Friday, 14 June
Afternoon, 2:00 to 4:30

- (a) Answer **Question 1** and **three** 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.*

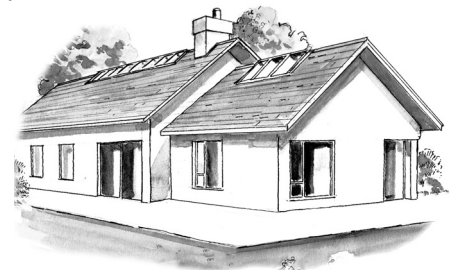
1. The eaves of a timber flat roof for a bathroom is constructed as shown in the sketch. The roof is covered with layers of bituminous felt on plywood decking on 200 mm × 50 mm roof joists. The roof is insulated and there is a plasterboard ceiling beneath. The external wall supporting the flat roof is a 350 mm concrete block wall with an insulated cavity.



- (a) To a scale of 1:5, draw a vertical section through the eaves of the flat roof and through the external wall. The section should show the typical construction details from 400 mm below the wallplate, through the wall, fascia, soffit and roof joists and include the roof surface. Show 1.5 metres length of roof joist and include **four** typical dimensions.
- (b) On your drawing, show how rainwater is removed from the flat roof.

2. The sketch shows a dwelling house which was built over ten years ago. The external walls of the house are 300 mm concrete block walls with an un-insulated cavity. It is proposed to improve the insulation properties of the external walls by:

- insulating the cavity *and*
- adding a system of insulation to the inside of the walls.



- (a) Using notes and neat freehand sketches, show how to apply **each** system of insulation to the wall. For **each** system of insulation, specify the insulation material used and include details of the internal surface finish of the wall.

- (b) List **two** advantages of improving the insulation properties of the external walls of the house.

3. (a) Using a single-line labelled diagram, show the pipework necessary to supply hot **and** cold water to a wash hand basin and a bath, as shown in the sketch.

Include the following in your diagram:

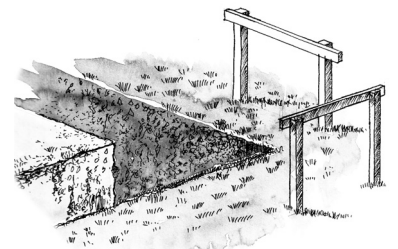
- water storage tank and overflow
- rising main
- hot water cylinder and pipework
- insulation to the water storage tank and to all pipework
- location of all necessary valves.



- (b) Show, using notes and neat freehand sketches, a design for a tap which will be easy to use by a person with limited hand mobility.

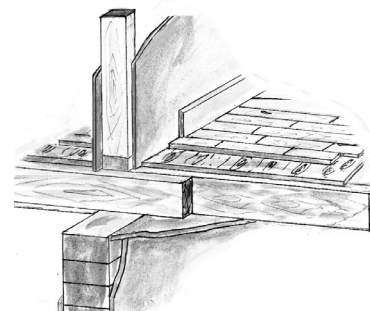
4. (a) One corner of a trench for a strip foundation is shown in the sketch. Describe, using notes and neat freehand sketches, the setting-out of a typical strip foundation under the following headings:

- levelling the profiles
- locating the position of the trench
- squaring the corner of the trench
- locating the finished level of the concrete in the foundation.



- (b) Draw a sketch of a typical strip foundation for a 350 mm concrete block external wall and show the position of the reinforcing in the foundation. Include **three** typical dimensions in your sketch.

5. A non load-bearing stud partition separates two upstairs bedrooms in a dwelling house. The floor and partition are supported on a 215 mm solid block wall, as shown in the sketch. The floor is a floating tongued and grooved oak floor on plywood, on 200 mm × 50 mm joists with a plasterboard ceiling beneath.



To a scale of 1:5, draw a vertical section through the stud partition and the floor. Show the typical construction details from a level 300 mm below the plasterboard ceiling, through the wall, floor and partition to a point 400 mm above the finished floor level. Include **three** typical dimensions on your drawing.

Note: Show a floor width of 500 mm at each side of the partition.

6. (a) For **each** of the following, draw the particular safety sign to indicate that the following personal protective equipment (*ppe*) must be worn on a construction site:
- eye protection
 - ear protection
 - safety gloves.

- (b) For **each** item of personal protective equipment listed at 6(a) above, outline **one** specific task on a building site where workers must wear the personal protective equipment.

- (c) List **one** other item of personal protective equipment that must be worn at all times on a construction site and discuss the reasons why the wearing of this item is compulsory.

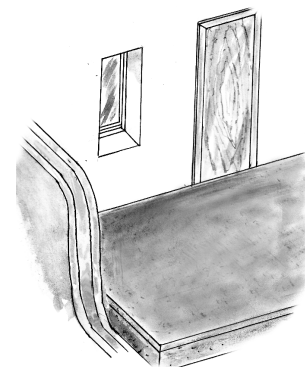


7. A dwelling house has an insulated solid concrete ground floor which abuts a 350 mm concrete block external wall with an insulated cavity, as shown in the sketch. The floor has a sand/cement fine screed finish.

- (a) Show, using notes and neat freehand sketches, the typical design detailing at the junction of the floor and wall. Label the floor components and include **three** typical dimensions.

- (b) Show clearly on your sketch the typical design detailing which will prevent the formation of a cold bridge at the junction of the floor and the wall.

- (c) Recommend a suitable floor covering for a bathroom on the ground floor of the house and give **two** reasons for your choice of floor covering.



8. Explain with the aid of notes and neat freehand sketches, any **five** of the following:

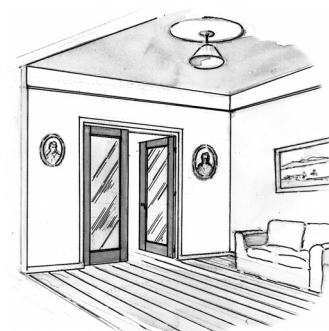
- solar panel
- dovetail halving joint
- sash cramp
- flue liner
- purlin
- water-table
- wind turbine
- low-e coating
- vapour barrier.

9. Two solid oak doors with glazed panels are fitted in the dividing wall between a sitting room and a kitchen, as shown in the sketch.

- (a) Show, using notes and neat freehand sketches, a suitable joint for joining the top rail to the vertical stile of the door.

- (b) Show, using notes and neat freehand sketches, how to fit **one** glass panel safely in the door.

- (c) Discuss **two** advantages of fitting glazed double doors between the sitting room and the kitchen in a dwelling house.





Leaving Certificate Examination, 2015

Construction Studies

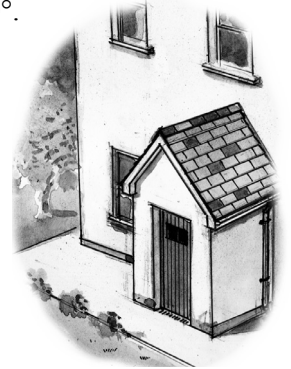
Theory - Ordinary Level

(200 marks)

Friday, 12 June
Afternoon, 2:00 to 4:30

- (a) Answer **Question 1** and **three** 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. A front porch with a tiled roof is shown in the sketch. The porch has an internal width of 2.0 metres. The roof of the porch, which is insulated, is a traditional cut roof and has a pitch of 30°. The roof is supported on a 400 mm concrete block wall with a 200 mm full-fill insulated cavity. The rafters and ceiling joists are 200 mm × 40 mm. Insulated plasterboard is also fixed to the underside of the ceiling joists.



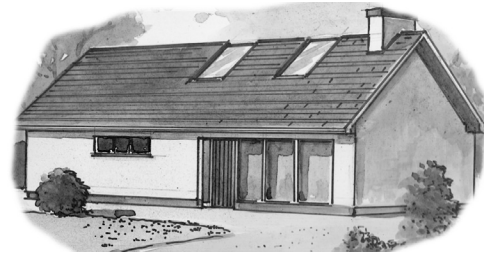
- (a) To a scale of 1:5, draw a vertical section through one half of the roof of the porch, to show one rafter length. Show the typical construction details from a level 400 mm below the wallplate, through the wall and eaves up to the ridge. Show **three** courses of tiles at eaves. Include **four** typical dimensions.

Note: It is not necessary to show the front door.

- (b) On your drawing, show clearly **one** method of securing the wallplate to the external wall.

2. The sketch shows a dwelling house which was built over 40 years ago. The external wall is a 300 mm concrete block wall with a 100 mm cavity. There is no insulation in the cavity. It is proposed to insulate the external wall by:

- filling the cavity with insulation
- and*
- adding an external system of insulation to the wall.



- (a) Using notes and freehand sketches, show the steps to be followed in applying **each** system of insulation to the wall.

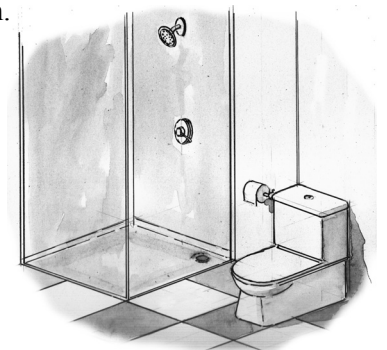
- (b) Discuss **two** advantages of insulating the external walls of the house.

3. (a) Using a single-line labelled diagram, show the pipework required to provide **hot and cold** water to a mixer-shower and to provide **cold** water to a toilet, as shown in the sketch.

Include the following on your diagram:

- rising main and water storage tank
- hot water cylinder
- typical pipework to mixer-shower and toilet
- all necessary valves.

On your diagram, show the insulation to the water storage tank in the attic and to all the pipework.



- (b) Using notes and sketches, show **two** methods of reducing the use of water in a bathroom.

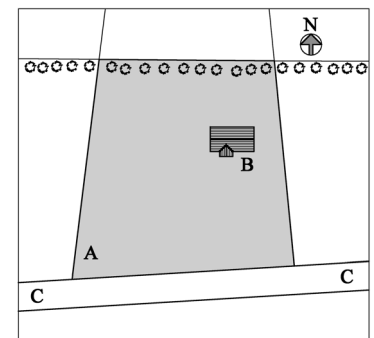
4. The shaded portion of the map shows a site **A** for a house. Also shown is the location of the house **B** and a roadway **C-C**.

- (a) Draw a large freehand sketch of the given site. Show on your sketch a preferred location for **each** of following:

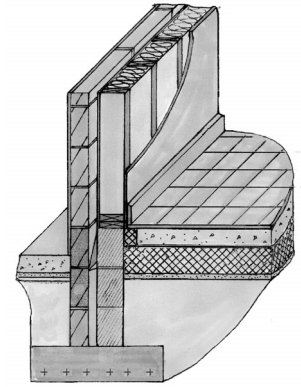
- the entrance to the site at the roadway
- the driveway to the house from the entrance
- the septic tank and percolation area.

- (b) For **each** of the above, discuss **one** reason why you selected the preferred location.

- (c) It is proposed to plant more trees on the site. Recommend **two** suitable types of tree and show on your sketch where you would plant the trees on the site. Discuss **two** advantages of planting the recommended trees on the site.



5. A traditional strip foundation supports the external wall of a dwelling house, as shown in the sketch. The external wall is of timber-frame construction, with a 100 mm concrete block outer leaf, a 50 mm cavity and a 200 mm insulated timber-frame inner leaf. The ground floor is an insulated concrete floor with a 20 mm quarry tile finish.



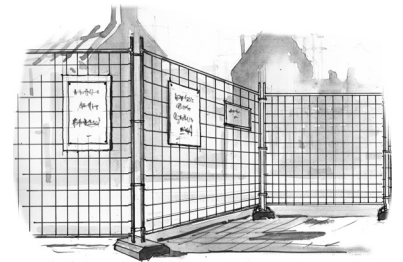
- (a) To a scale of 1:5, draw a vertical section through the foundation, external wall and ground floor. Show the typical construction details from the bottom of the foundation, through the wall and ground floor to a level 400 mm above finished floor. Include the radon barrier and show **four** typical dimensions.
- (b) On your drawing, show clearly the position of the insulation in the wall **and** in the floor.

6. (a) Draw the particular safety signs to show the personal protective equipment (PPE) for **each** of the following:

- hand protection
- ear protection
- eye protection.

(b) For **each** of the above, state **one** specific activity where the personal protective equipment you have shown should be worn on a construction site.

(c) Outline **two** activities in the Construction Studies room where it is recommended that personal protective equipment should be worn.

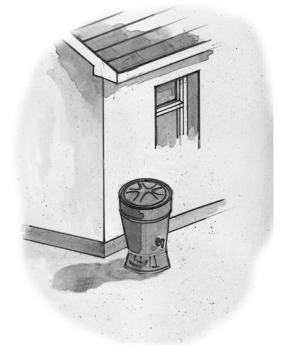


7. A water butt is used to collect rainwater from the pitched roof of a house, as shown.

(a) Using notes and freehand sketches, show the pipework necessary to collect the rainwater from the roof and to store it in the water butt.

(b) Discuss **two** advantages and **two** disadvantages of using a water butt to store rainwater.

(c) Discuss **two** reasons why it is advisable to harvest rainwater.



8. Explain, with the aid of notes and freehand sketches, any **five** of the following:

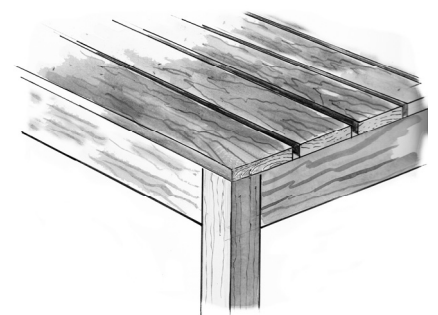
- box dovetail joint
- triple glazing
- solar panel
- cordless drill
- skirting board
- compression fitting
- natural seasoning
- concrete lintel
- radon barrier.

9. The sketch shows portion of a wooden table. The table is designed for outdoor use.

(a) Using notes and freehand sketches, show a suitable joint for attaching one of the rail to the leg of the table. Give **one** reason for choosing this joint.

(b) Using notes and freehand sketches, discuss **two** design features that make the table suitable for outdoor use.

(c) Recommend a suitable finish for the table. Describe, using notes and freehand sketches, the steps involved in preparing the wood and in applying the recommended finish to the tabletop.





Leaving Certificate Examination, 2016

Construction Studies

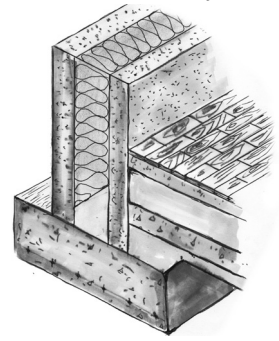
Theory - Ordinary Level

(200 marks)

Friday, 17 June
Afternoon, 2:00 to 4:30

- (a) Answer **Question 1** and **three** 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. A dwelling house has a 400 mm external concrete block wall with a 200 mm full-fill insulated cavity. The ground floor is an insulated concrete floor with a 20 mm floating tongue-and-groove hardwood finish, as shown.

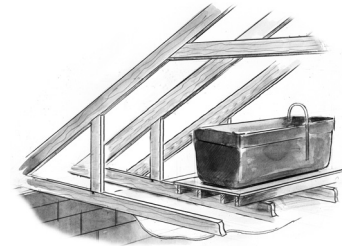


- (a) To a scale of 1:5, draw a vertical section through the strip foundation, the external wall and the ground floor. Show the typical construction details from the bottom of the foundation to a level 400 mm above finished floor. Show the position of the radon barrier and include **four** typical dimensions on your drawing. *Show 1.0 metre width of floor.*
- (b) On your drawing, show the typical design detailing to prevent the formation of a thermal bridge at the junction of the external wall and the floor.

2. The owners of a house have decided to insulate their house over a number of years, starting with the attic space. The rafters and ceiling joists are 200 mm × 40 mm. The water storage tank is in the attic, as shown.

- (a) Draw a large freehand sketch of the attic space. On your sketch, show the typical design detailing necessary to insulate, to a high standard, **each** of the following:

- attic space
- water storage tank *and*
- pipework.



- (b) Discuss **two** reasons why the attic space is chosen as the first area to be insulated.

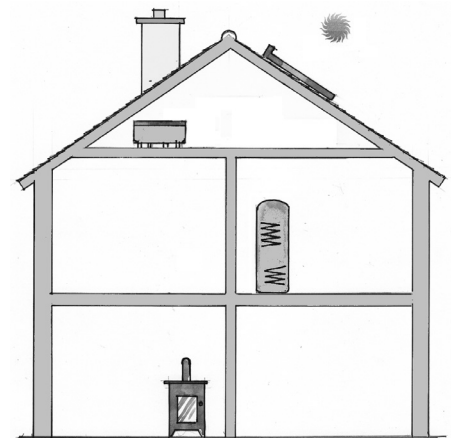
3. The sketch shows a wood burning stove which is combined with a solar collector to provide hot water for a dwelling house. Also shown are a dual-coil hot water cylinder and the expansion tank in the attic.

- (a) Draw a large freehand sketch of the given diagram and also include the main cold water storage tank in the attic. Show the pipework required to connect the stove to the cylinder. Include the following on your sketch:

- rising main and the main cold water storage tank
- hot water cylinder and expansion pipe
- stove and pipework from stove to cylinder
- all necessary valves.

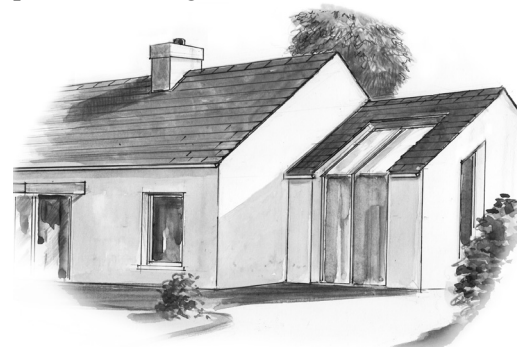
- (b) On the same sketch, show also the pipework necessary to connect the solar collector on the roof to the cylinder.

- (c) Discuss **two** advantages of including a solar collector to provide domestic hot water for a house.



4. The owners intend to apply for planning permission to build a sunspace on to the gable end of their house, as shown in the sketch.

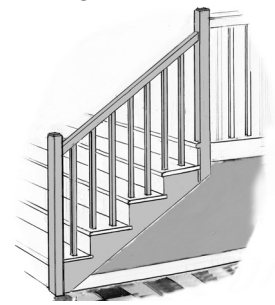
- (a) Discuss **two** reasons why it is necessary to apply for planning permission to build the sunspace shown.
- (b) State the information that must be contained in **each** of the following planning documents:
- site layout map
 - planning notice in newspaper.



- (c) Discuss **one** reason why the planning authority allows the public to view all planning documents after a planning application is submitted.

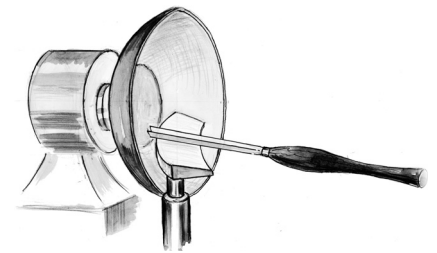
5. The sketch shows a portion of a cut string wooden stairs. The stairs leads to a small landing as shown. The newel post is 100 mm × 100 mm and the balusters are 50 mm × 50 mm. The rise of each step is 175 mm.

- (a) To a scale of 1:5, draw a vertical section through the bottom **three** steps of the stairs. Show the cut string, newel post, handrail and balusters.
- (b) On your drawing, show how **one** baluster is fitted securely to the thread.



6. (a) Outline **two** specific safety precautions to be observed in the Construction Studies room in **each** of the following situations:
- using a scalpel to cut modelling card
 - carrying a chisel
 - using a contact adhesive.

- (b) Using notes and freehand sketches, describe **three** specific safety precautions to be observed when turning a wooden bowl on a lathe, as shown. Give **one** reason for each safety precaution outlined.

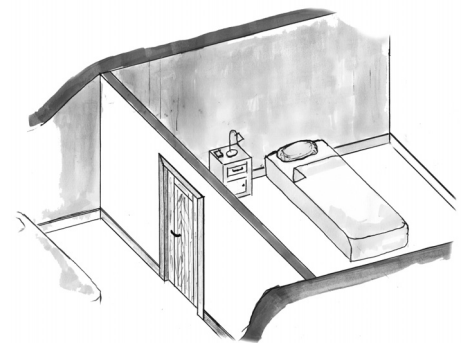


7. A non load-bearing timber stud partition with a plasterboard finish separates two bedrooms on the ground floor of a house. A solid wooden door is fitted in the stud partition, as shown.

- (a) Using notes and freehand sketches show the typical construction details of the stud partition. Show clearly the studwork necessary to accommodate the doorframe. Indicate on your sketch the names and typical sizes of all components.

- (b) On a separate annotated sketch, show **one** method that would help reduce the transmittance of sound through the stud partition.

- (c) Describe briefly **one** method of providing a surface finish to the plasterboard prior to painting.

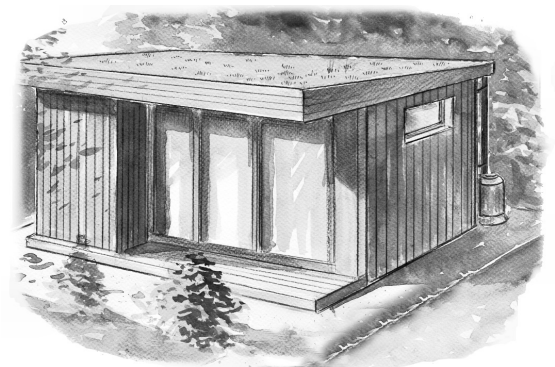


8. Explain, with the aid of notes and freehand sketches, any **five** of the following:

- | | | |
|------------------|---------------------------|----------------|
| • lever valve | • mortice and tenon joint | • cob wall |
| • thermal bridge | • dual flush toilet | • smart meter |
| • solar gain | • low-e glazing | • access ramp. |

9. The sketch shows an eco-friendly garden room with an external wooden cladding.

- (a) Specify a suitable wood for the external cladding, and give **two** reasons for your choice of wood.
- (b) Recommend a suitable applied finish to preserve the external cladding. Using notes and freehand sketches, describe the steps involved in preparing the wood and in applying the recommended surface finish.
- (c) Discuss **two** features of the design that ensure the garden room is eco-friendly.





Leaving Certificate Examination, 2017

Construction Studies

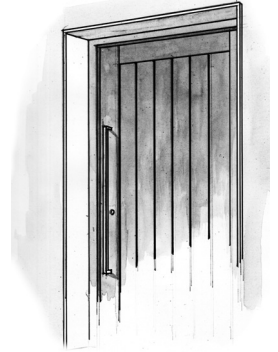
Theory - Ordinary Level

(200 marks)

Friday, 16 June
Afternoon, 2:00 to 4:30

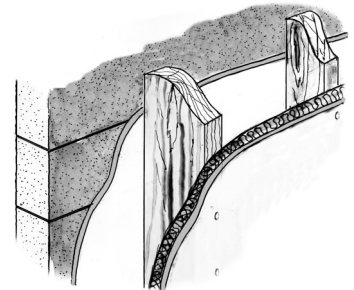
- (a)*** Answer **Question 1** and **three** other questions.
- (b)*** All questions carry equal marks.
- (c)*** Answers must be written in ink.
- (d)*** Drawings and sketches to be made in pencil.
- (e)*** Write the number of the question distinctly before each answer.
- (f)*** Neat freehand sketches 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. The main door of a house is an insulated wooden door with 12 mm cedar sheeting on both sides, as shown. The door is fitted in a 400 mm concrete block external wall with a full-fill insulated cavity. The wall is rendered on both sides. The doorframe is 150 mm × 70 mm and the door is 90 mm in thickness.



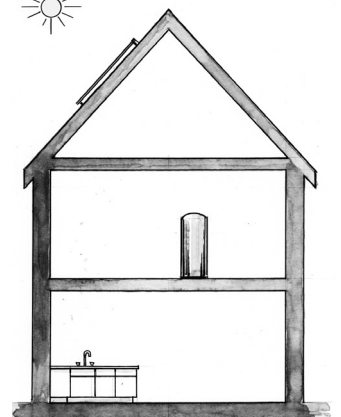
- (a) To a scale of 1:5 draw a vertical section through the top of the door, showing the wall, the concrete lintels over the door, the doorframe and the door. Show the typical construction details from 400 mm below the lintels to a level 400 mm above the lintels. Include **three** typical dimensions on your drawing.
- (b) Show clearly on your drawing how to prevent the penetration of rainwater at the head of the door.

2. The external wall of a new house has a 100 mm concrete block outer leaf, a cavity and a 200 mm inner leaf of timber frame construction, as shown. The inner leaf is insulated and insulated plasterboard is also fixed to the timber studs.



- (a) Using notes and freehand sketches show how the inner leaf is to be insulated. Specify the type and thickness of insulation.
- (b) List **two** advantages of insulating the **inner** leaf of the wall.
- (c) On a separate sketch, show **one** method of providing a surface finish to the plasterboard prior to painting.

3. (a) A solar panel is used to provide hot water for a dwelling house as shown. Draw a large freehand sketch of the given house and, on your sketch, show the pipework necessary to supply **hot water** to a kitchen sink.



Include the following in your diagram:

- solar panel
- rising main and cold water storage tank
- hot water cylinder, as shown
- pipework from solar panel to cylinder
- expansion tank / vessel
- pipework to hot tap
- all necessary valves.

- (b) Discuss **two** advantages of using a solar panel to provide hot water for a dwelling house.
- (c) On a **separate sketch**, show a design for a tap which will be easy to use by a person with limited hand movement.

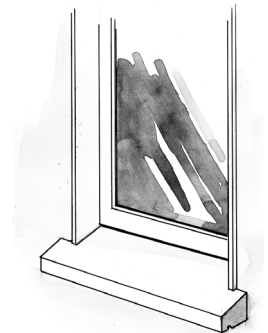
4. (a) The sketch shows waste materials from a house under repair. To improve waste management, this waste needs to be sorted and stored on-site for reuse. Using notes and freehand sketches, show how to properly sort and store this waste.

- (b) Discuss **two** reasons why waste should be kept to a minimum on a construction site.
- (c) Recommend **two** suitable uses for the wood that has been sorted on-site for reuse, and give **one** specific reason in support of **each** recommendation.



5. A triple-glazed wooden casement window, as shown, is fixed in a 400 mm external concrete block wall with a full-fill insulated cavity. The fixed frame of the window is 100 mm × 80 mm and is thermally broken. The wall is rendered on both sides.

- (a) To a scale of 1:5, draw a vertical section through the external wall and bottom portion of the window, showing the fixed frame of the window and the concrete cill. Show the typical construction details from 300 mm below to a level 250 mm above the concrete cill. Include **three** typical dimensions on your drawing.

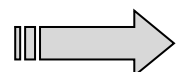


- (b) Show on your drawing the typical design detailing to prevent the formation of a cold bridge at the concrete cill.

6. (a) Discuss **two** reasons why safety signs must be displayed at the entrance to a construction site, as shown.

- (b) Using notes and freehand sketches, show **three** items of personal protective equipment (PPE) that must be worn by workers on a construction site. Give **one specific** reason why each item of personal protective equipment must be worn.

- (c) Describe **two** specific safety precautions that should be observed when using electric power tools on a construction site.



7. The sketch shows an attic which is being converted to provide an additional bedroom. The floor is a tongue-and-groove hardwood floor.

- (a) Show, using notes and freehand sketches, **one** method of preventing the floor joists from twisting.
- (b) Using a large freehand sketch, show the tongue-and-groove joint between two flooring boards and list **two** advantages of this method of jointing.
- (c) Discuss **one** advantage and **one** disadvantage of converting an attic to provide additional bedroom accommodation.

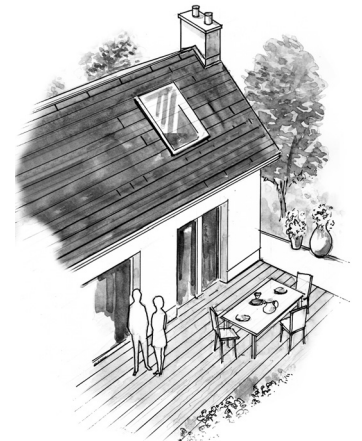


8. Explain, with the aid of notes and freehand sketches, any **five** of the following:

- handrail
- damp-proof course
- wind turbine
- box dovetail joint
- ball valve
- joist hanger
- purlin
- energy rating
- service cavity.

9. The sketch shows sliding doors which open on to an external patio at the rear of a house. The patio is constructed using softwood decking on wooden joists.

- (a) Show, using notes and freehand sketches, how to fix the wooden decking to the joists to ensure that the decking does not warp or bow, especially during wet weather.
- (b) Recommend a suitable applied finish to preserve the external decking. Using notes and freehand sketches, describe the steps involved in preparing the wood and in applying the recommended applied finish.
- (c) An external patio has many advantages for the occupants of a dwelling house. Discuss **two** advantages of having an external patio, as shown.





Leaving Certificate Examination, 2018

Construction Studies

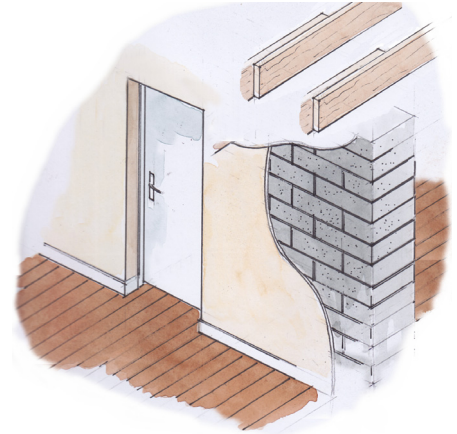
Theory - Ordinary Level

(200 marks)

Friday, 15 June
Afternoon, 2:00 to 4:30

- (a)*** Answer **Question 1** and **three** other questions.
- (b)*** All questions carry equal marks.
- (c)*** Answers must be written in ink.
- (d)*** Drawings and sketches are 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. A 215 mm solid concrete block wall separates two rooms on the ground floor of a dwelling house, as shown. A strip foundation supports the wall, which is plastered on both sides. A flush panel door, 60 mm in thickness, is fixed in the wall. The doorframe is 120 mm × 50 mm. The insulated concrete ground floor is finished with a 20 mm tongue and groove floating hardwood floor.

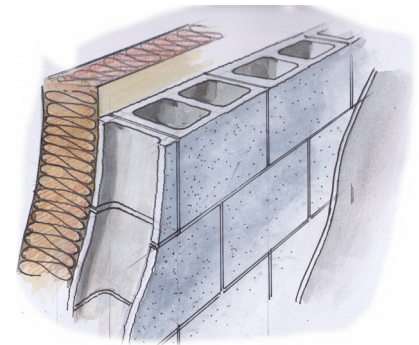


- (a) To a scale of 1:5 draw a vertical section through the strip foundation, the 215 mm wall, the ground floor and the centre of the door up to a point 500 mm above finished floor level. Show 600 mm width of floor on each side of the wall and include **three** typical dimensions on your drawing.

- (b) Show on your drawing the typical design detailing to prevent radon gas from entering the rooms through the floor.

2. The external wall of a house built in the 1960s is of 215 mm single-leaf hollow block construction. The wall is plastered on both sides, as shown. It is proposed to improve the insulation properties of the house by fixing an external system of expanded polystyrene to the wall.

- (a) Using notes and freehand sketches show **one** suitable method of applying an external insulation system to the wall. Specify the typical thickness of the insulation.



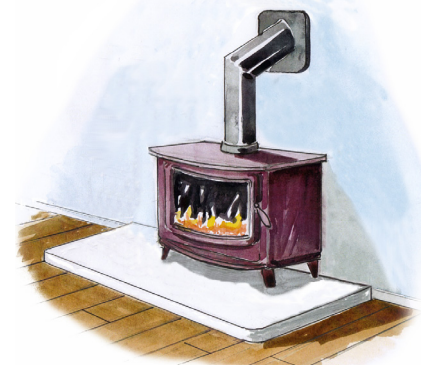
- (b) On your sketch show clearly the steps to be followed in applying a surface finish to the insulation. Specify the materials to be used for the surface finish.

- (c) Discuss **one** advantage and **one** disadvantage of applying an external system of insulation to the walls of a house.

3. (a) A wood-burning stove with a back boiler, as shown, is used to heat water for a dwelling house. Using a single-line labelled diagram, show the pipework required to supply **hot water** to a shower.

Include the following in your diagram:

- wood-burning stove
- rising main and cold water storage tank
- hot water cylinder and expansion tank
- pipework to shower and all necessary valves.



- (b) Discuss **one** advantage of using a wood-burning stove to heat water for the house.

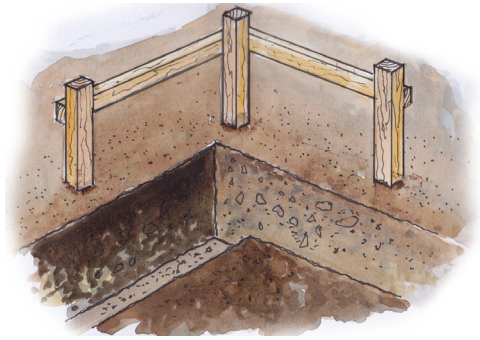
4. The sketch shows one corner of a strip foundation for the external wall of a dwelling house. The external wall is to be a 400 mm concrete block wall with a full-fill insulated cavity.

(a) Discuss **one** environmental reason why a strip foundation is considered the most suitable foundation for this house.

(b) Using notes and freehand sketches describe how to set out the foundation trench under the following headings:

- profiles
- width and depth of trench
- position of wall on strip foundation.

(c) Using notes and freehand sketches, show how to determine the top surface of the foundation prior to placing the concrete to ensure that the foundation is level throughout.

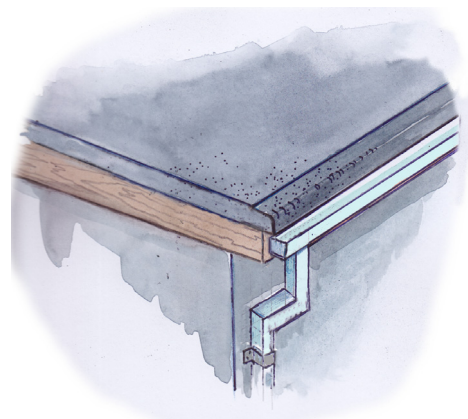


5. The sketch shows portion of the eaves of a flat roof. The roof is covered with layers of bituminous felt, on a 20 mm plywood deck, on battens, on sloping firring pieces, on 200 mm × 50 mm joists. The roof is highly insulated and there is an insulated plasterboard ceiling beneath.

The external wall supporting the roof is a 400 mm concrete block wall with a full-fill insulated cavity. The wall is rendered on both sides.

(a) To a scale of 1:5, draw a vertical section through the eaves of the flat roof and through the external wall. Show the typical construction details from 500 mm below the roof joists, through the external wall, wallplate, fascia, soffit, and roof joists and include the roof surface. Show 1.5 metres length of roof joist and include **three** typical dimensions on your drawing.

(b) On your drawing show how the roof is ventilated at the eaves.



6. (a) Draw a large freehand sketch of the safety sign for **each** of the items of personal protective equipment (PPE) listed below:

- high-visibility vest
- protective footwear
- safety helmet.

(b) Using notes and freehand sketches, describe **one** design feature of **each** of the above safety items that helps to protect the worker from injury.

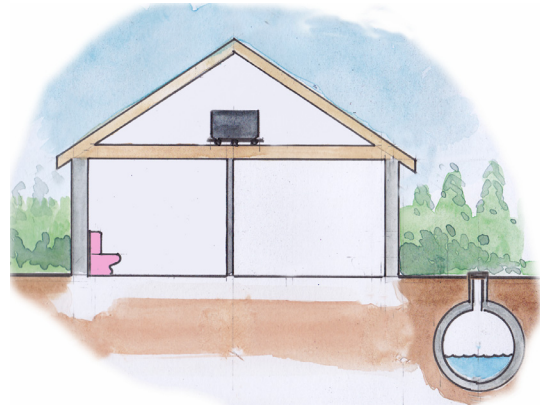
(c) Recommend **one** other item of personal protective equipment (PPE) which should be worn by workers on a construction site. Give **one** reason for your recommendation.



7. It is proposed to collect rainwater from the roof of a house and to store it in an underground tank as shown.

(a) Draw the given sketch and show the pipework necessary to collect the rainwater from the roof and to convey it to the underground storage tank. Label the main components and give their typical sizes.

(b) The stored rainwater is used for flushing a toilet. Show, using notes and freehand sketches, the pipework and pump necessary to take the water from the underground tank to a storage tank in the attic. Show also how to connect the toilet cistern to the storage tank in the attic. Include the necessary valves.



(c) Discuss **one** advantage of storing rainwater in an underground tank.

8. Explain, with the aid of notes and freehand sketches, any **five** of the following:

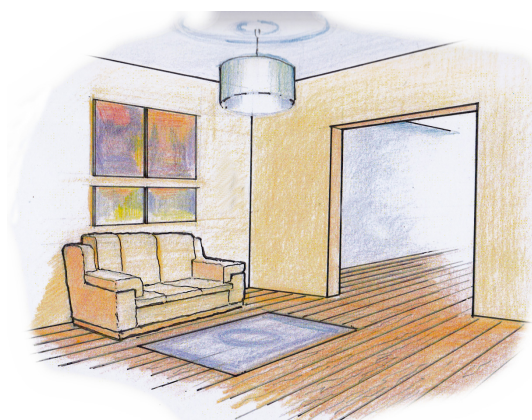
- smart meter
- biscuit joint
- earth rod
- airtightness tape
- evacuated tube
- magnetic catch
- roof-light window
- aerated shower
- LED lighting.

9. The sketch shows an existing opening in a 100 mm concrete block wall separating a sitting room and a dining room. It is proposed to fit a doorframe and glazed wooden double doors in this opening.

(a) Show, using notes and freehand sketches, how the blockwork over the opening is typically supported.

(b) Show, using notes and freehand sketches, how the doorframe is held square while it is being fitted and show **one** method of fixing the doorframe to the wall.

(c) Discuss **one** advantage and **one** disadvantage of fitting glazed double doors between the sitting room and the dining room.





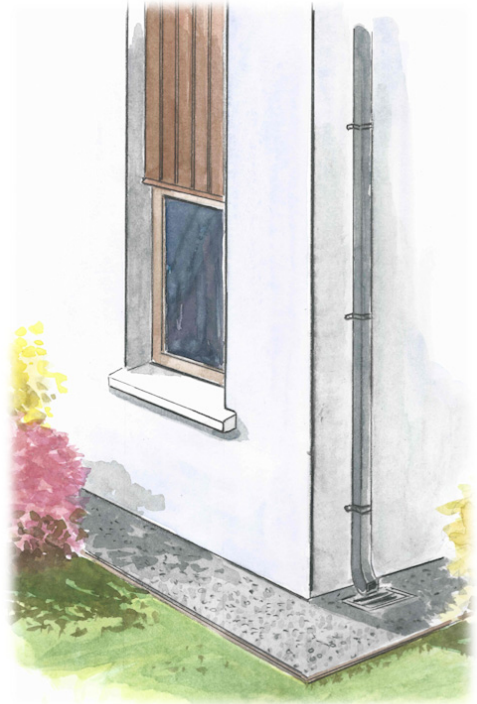
Leaving Certificate Examination, 2019

Construction Studies
Theory - Higher Level
(300 marks)

Friday, 14 June
Afternoon, 2:00 - 5:00

- (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 are 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. A triple glazed window with a wooden frame is fitted in the external wall of a dwelling house as shown. The fixed frame of the window is 100 mm × 80 mm. The wall is of timber frame construction with an external concrete block leaf. The internal timber frame is 250 mm × 50 mm and the outer leaf is of 100 mm concrete block construction with an external render finish. A 50 mm service cavity is also provided at the internal surface. Above the window head, an inset wooden panel is sheathed with vertical larch cladding of 130 mm × 20 mm to form an external rainscreen, as shown. The window is 600 mm in height and has a thermally broken insulated frame.

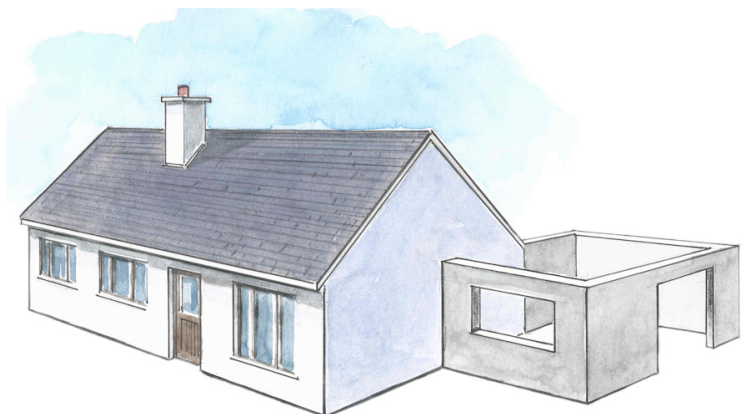


- (a) To a scale of 1:5, draw a vertical section through the fixed frame of the window and the external wall of the house. Show the typical construction detail from a level 400 mm below the window cill, through the window frame, up to a level 500 mm above the window head.
- (b) On your drawing, show the typical design detailing to prevent the ingress of rainwater at the window cill.

2. (a) Discuss in detail, using notes and freehand sketches, **three** functional requirements of a roof suitable for a domestic dwelling house.
- (b) The owners of a house located in a rural setting wish to build an extension to create an additional living space. The sketch shows the existing house and the proposed outline of the new extension at design stage.

Using notes and freehand sketches, show the design for **three** different, distinct roof profiles suitable for the proposed extension.

Recommend a preferred roof profile for the proposed extension **and** justify your recommendation.

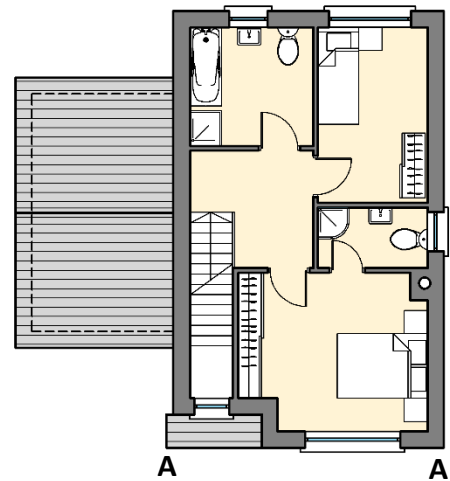


- (c) Select a different roofing material for **each** of the three roof types you have shown at 2(b). Give **one** advantage and **one** disadvantage for **each** material selected.

3. The drawing shows the elevation of a detached house and the plan of its first floor. The front wall **A-A** is south facing. The owners intend to apply for planning permission to build an additional bedroom and *en suite* bathroom. It is proposed to remove the roof of the single storey extension on the left and build the bedroom and bathroom over it.



- (a) Discuss in detail, **three** design considerations for the proposed bedroom and *en suite* bathroom.
- (b) Using notes and freehand sketches, show a proposed internal layout for the bedroom and *en suite* bathroom that incorporates each of the design considerations you outlined at **3(a)** above. Justify your choices.
- (c) Using notes and freehand sketches, show an external design for **your extension** that will enhance the overall visual appearance of the house.



4. The sketch shows a row of terraced townhouses built over 100 years ago. A young couple have purchased one of the houses and have decided to refurbish it as their family home.

- (a) Discuss **three** benefits to the local community of refurbishing one of the townhouses as a family home.
- (b) The owners commissioned a survey of the house which revealed the following:



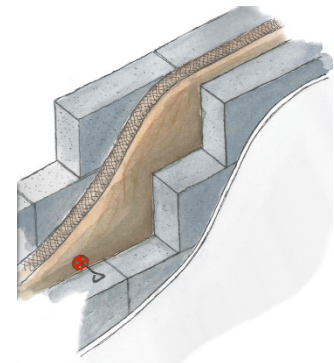
- traditional cut roof with natural slates
- softwood sliding sash windows with single-glazing
- solid external walls of brick construction, uninsulated and with internal lime render.

Select any **two** of the above areas and, using notes and freehand sketches, describe in detail the steps involved in upgrading each area selected in a manner that respects the appearance and character of the original townhouses.

5. The external wall of a house built in the 1990s is of 100 mm concrete block construction with a 100 mm partially filled cavity, as shown.

(a) Calculate the U-value of the wall, given the construction has the following sequence and data:

External render	thickness	16 mm
Concrete block outer leaf	thickness	100 mm
Clear cavity	width	50 mm
Polystyrene insulation	thickness	50 mm
Concrete block inner leaf	thickness	100 mm
Internal plaster	thickness	12 mm



Thermal data of the external wall:

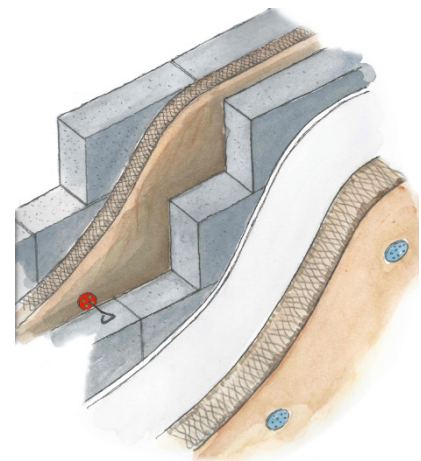
Resistance of external surface	(R)	0.048	m ²	°C/W
Resistivity of external render	(r)	2.170	m	°C/W
Conductivity of concrete external blockwork	(k)	1.440	W/m	°C
Resistance of clear cavity	(R)	0.170	m ²	°C/W
Conductivity of insulation	(k)	0.037	W/m	°C
Conductivity of concrete internal blockwork	(k)	1.440	W/m	°C
Resistivity of internal plaster	(r)	6.250	m	°C/W
Resistance of internal surface	(R)	0.122	m ²	°C/W

(b) Using the U-value of the wall obtained at 5(a) above and the following data, calculate the cost of heat lost annually through this wall:

- area of external wall 135 m²
- average internal temperature 19 °C
- average external temperature 5 °C
- heating period 9 hours daily for 36 weeks per annum
- cost of oil 94 cent per litre
- calorific value of oil 37350 kJ per litre
- 1000 Watts 1 kJ per second.

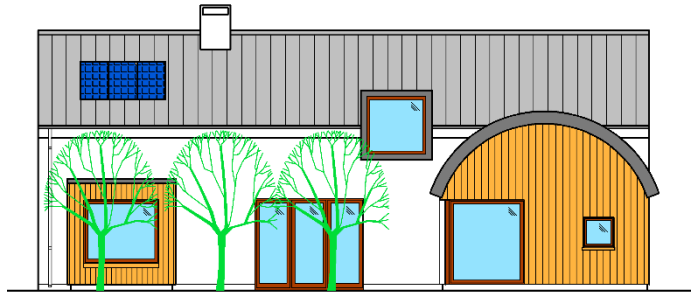
(c) It is proposed to upgrade the thermal properties of the above wall, to meet the Passive House standard, by fixing expanded polystyrene to the external surface, as shown.

Given the thermal conductivity (k) of expanded polystyrene as 0.031 W/m°C, calculate the thickness of expanded polystyrene required to achieve a U-value of 0.15 W/m²°C.



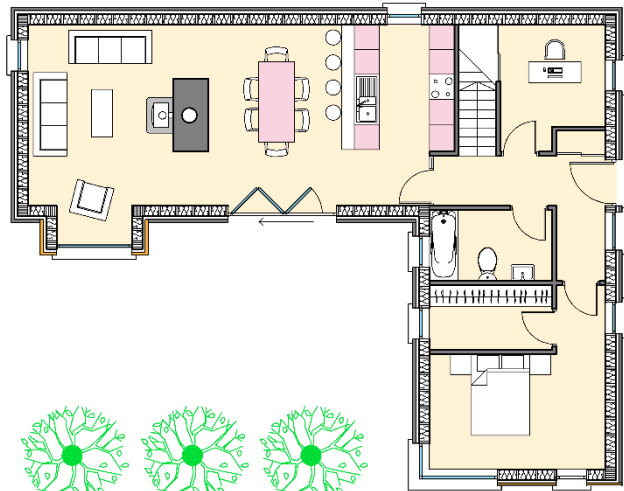
6. The elevation and ground floor plan of a house are shown. The house has two bedrooms and a bathroom upstairs. The external walls are of timber frame construction with a rendered concrete block and timber cladding finish. The house is designed to have low environmental impact.

- (a) With reference to the design shown, discuss using notes and freehand sketches, **three** features of the design that contribute to the house having a low environmental impact.



- (b) Using notes and freehand sketches, discuss in detail **each** of the following renewable energy technologies and identify how each contributes to making a home more eco-friendly:

- evacuated tubes
- wind turbines
- photovoltaic panels.



- (c) Discuss in detail **two** advantages of using local craft skills when building the house shown.



7. The main hall of a two-storey dwelling has a closed riser wooden stairs. The bottom of the stairs has a bullnose step as shown. The newel post is 120 mm × 120 mm and the rise of a step should not exceed 175 mm.

- (a) To a scale of 1:5, draw a vertical section through the centre of the stairs. The section should show the typical construction detail through the bottom **three** steps of the stairs, showing the newel post, string, balusters and handrail.

Include the typical dimensions of **three** structural members of the stairs.

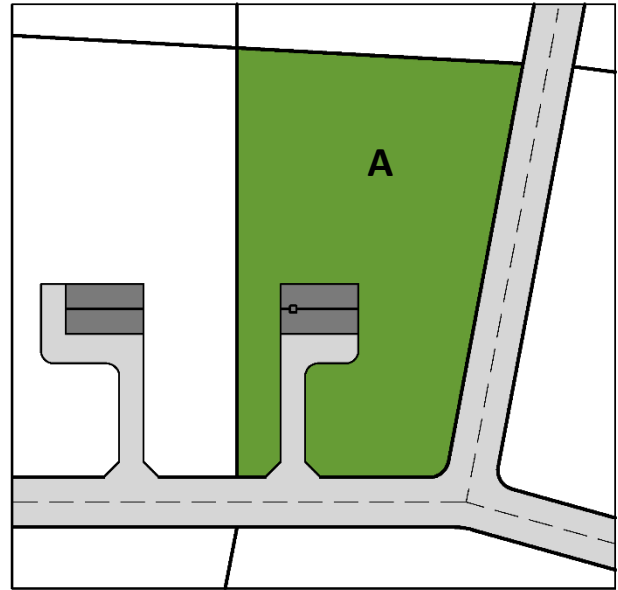
- (b) Indicate on your drawing **three** design features that ensure the stairs is safe for users.



8. (a) Discuss **three** considerations to ensure the proper treatment and disposal of sewage when selecting a site for a house in a rural location.

- (b) The drawing shows a site layout map. The outline of a new house and driveway is shown on site **A**. Using notes and freehand sketches, show the design layout necessary for a typical wastewater treatment system and percolation area on this site.

Include typical dimensions for the system.



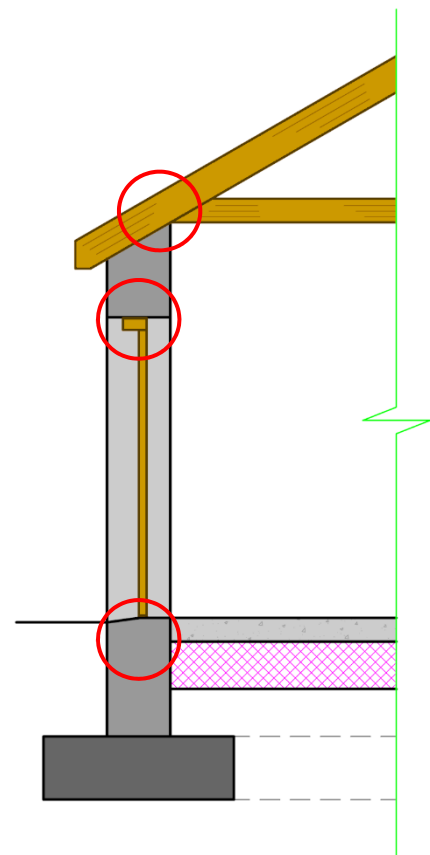
- (c) Using notes and freehand sketches, discuss an alternative method, other than a typical percolation area to ensure the safe treatment of wastewater from a dwelling house.

9. Thermal envelope continuity is essential to ensure a dwelling house is thermal bridge free. The drawing shows an outline section through the external door of a single-storey house having a 450 mm external concrete block wall with a 250 mm full-fill insulated cavity.

The house has a traditional cut roof with an insulated solid concrete ground floor. The external door and frame are thermally broken.

- (a) Using notes and freehand sketches, show best practice design detailing that will prevent the formation of a thermal bridge at **each** location circled on the drawing.

- (b) Discuss **two** negative impacts of thermal bridging as a result of poor design detailing.

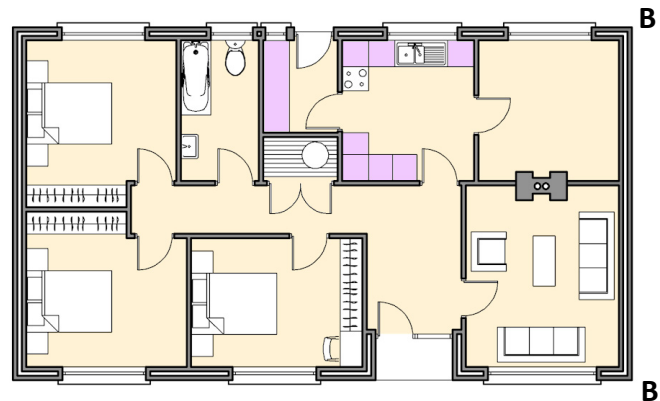


10. The plan and elevation of a bungalow built in the 1970s are shown. The wall **B-B** is south facing. The owners intend to carry out a deep retrofit upgrade of their house to meet the **EnerPHit** Passive House standard.

- (a) Using notes and freehand sketches, outline **three** design considerations necessary to achieve the **EnerPHit** Passive House design standard.



- (b) Discuss in detail, using notes and freehand sketches, how you would retrofit the given house to include each consideration you specified at **10(a)** above.



- (c) Discuss **two** advantages of retrofitting an existing house to meet the **EnerPHit** standard.

OR

10. “Global warming is now a generally recognised phenomenon and sustainability is recognised as being a necessity, not an option. One of the main culprits blamed for global warming is carbon dioxide (CO₂), so it is worth taking a look at what can be done about it. CO₂ is produced by each of us every day, and our personal carbon footprint is a measure of how many tonnes of CO₂ are emitted directly or indirectly, as a result of the consumption of goods and services. When building your own home you should take every opportunity to build in the most sustainable way so as to minimise your own carbon footprint.”

Adapted from: **Building Your Own Sustainable and Energy Efficient House.**

by Henry Skates

Published by: The Crowood Press Ltd. ISBN: 978-1-84797-258-3

Discuss the above statement in detail and propose **three** best practice guidelines that would ensure that buildings are built in the most sustainable way possible and thus minimise their carbon footprint.

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Leaving Certificate Examination, 2020

Construction Studies
Theory - Higher Level
(300 marks)

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 are 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. The sketch shows a dwelling house with a traditional slated cut roof. The roof has a pitch of 30° and flush eaves as shown. The internal span of the house is 6.0 metres and the roof is highly insulated. The external wall of the house is a 215 mm single leaf wall of solid concrete block construction with 200 mm external insulation and acrylic render external finish. Insulated plasterboard is fixed to the underside of the ceiling joists. A 50 mm service cavity is also provided at the internal surface of the wall.

- (a) To a scale of 1:10, draw a vertical section through one half of the roof structure from just below eaves up to ridge. Show one external wall and one rafter length. Include the typical construction details from 600 mm below the ceiling joists up to the ridge and include **three** courses of slate at eaves.

Include **four** typical dimensions of the roof structure.

- (b) On your drawing, show the typical design detailing to ensure ventilation of the roof structure.



2. (a) Discuss in detail, using notes and freehand sketches, **two** specific best practice guidelines to be observed for **each** of the following when using scaffolding on a construction site:

- erecting scaffolding
- accessing scaffolding
- use of working platforms.

- (b) The on-site Health and Safety Officer performs a key role in maintaining a safe working environment on a construction site.

Discuss in detail **three** responsibilities of a Health and Safety Officer on a construction site.

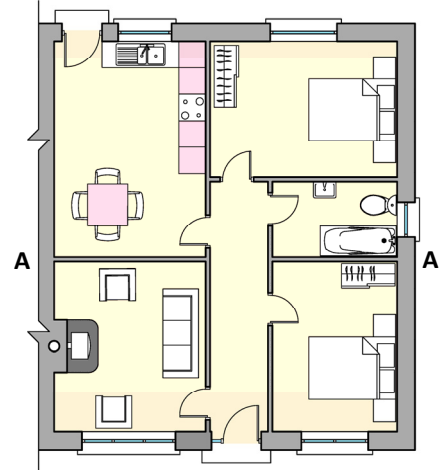


3. The drawing shows the floor plan and front elevation of a semi-detached bungalow. The internal wall **A-A** is load-bearing. The rear wall of the house is south facing.

The owners intend to modify the internal layout to:

- make it fit for use by a person with limited mobility
- create a bright open-plan kitchen/living space.

- (a) Discuss in detail, **three** design considerations necessary when modifying the internal layout of the house shown to meet the needs of a person with limited mobility.
- (b) Using notes and freehand sketches, show a revised internal layout that incorporates each of the design considerations you outlined at **3(a)** above **and** include the open-plan kitchen/living space. Justify your choices.
- (c) Discuss **two** advantages and **two** disadvantages of open-plan living in a domestic house.



4. The sketch shows a vacant site located between two existing dwellings in an urban area. The owners are at the design stage for a new house to be built on this site. It is proposed that the characteristics of existing dwellings should have an influence on the external house design.

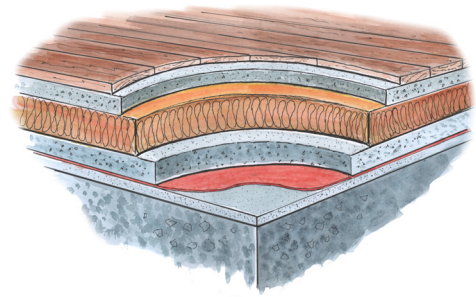
- (a) Using notes and freehand sketches, discuss the importance of considering **each** of the following characteristics when designing a house for this site:
- materials and finishes
 - shape and form
 - streetscape.

- (b) Using notes and freehand sketches, show a proposed external design for a house to be located on this site, which incorporates each of the characteristics discussed at **4(a)** above. Justify your proposed design solution.



- (c) Discuss in detail **two** advantages of developing vacant sites in urban areas.

5. A house built to nZEB standards has a highly insulated solid concrete ground floor with a hardwood finish, as shown.



- (a) Calculate the U-value of the floor, given the construction has the following sequence and data:

Hardwood flooring	thickness	20 mm
Sand/cement fine screed	thickness	65 mm
Floor insulation	thickness	200mm
Concrete floor slab	thickness	150 mm
Radon Barrier	thickness	0.25 mm
Sand blinding	thickness	40 mm
Hardcore	thickness	200 mm
Subsoil	thickness	300 mm

Thermal data of the ground floor:

Resistance of internal top surface of floor	(R)	0.104	m ²	°C/W
Conductivity of hardwood flooring	(k)	6.666	W/m	°C
Resistivity of fine screed	(r)	1.410	m	°C/W
Conductivity of floor insulation	(k)	0.022	W/m	°C
Conductivity of concrete floor slab	(k)	1.280	W/m	°C
Conductivity of radon barrier	(k)	0.250	W/m	°C
Conductivity of sand blinding	(k)	0.160	W/m	°C
Conductivity of hardcore	(k)	1.350	W/m	°C
Conductivity of subsoil	(k)	1.600	W/m	°C

- (b) Using the U-value of the floor obtained at **5(a)** above and the following data, calculate the cost of heat lost annually through this floor:

- dimensions of floor slab 6.5 metres × 9.0 metres
- average internal temperature 20 °C
- average temperature of subsoil 6 °C
- heating period 9 hours daily for 39 weeks per annum
- cost of oil 96 cent per litre
- calorific value of oil 37350 kJ per litre
- 1000 Watts 1 kJ per second.

- (c) Using notes and a freehand sketch, show best practice design detailing that will prevent the formation of a thermal bridge at the junction of the concrete floor and an external concrete block wall with a full-fill insulated cavity.

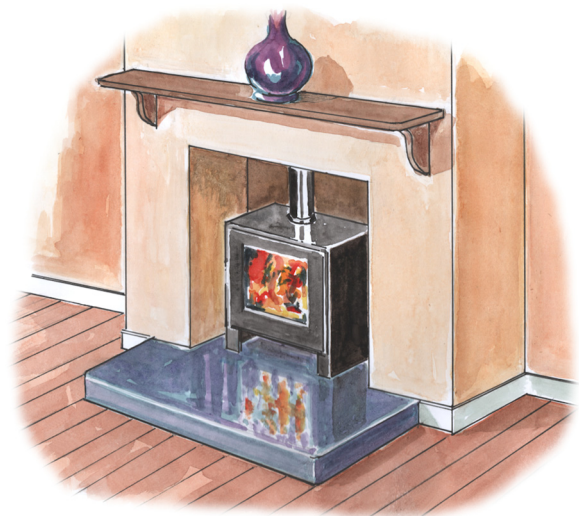
6. The elevation and ground floor plan of an Irish vernacular cottage, which has been retrofitted and extended, are shown. The existing cottage has been upgraded to meet **EnerPHit** Passive House standard. The new extension on the right has two bedrooms and a bathroom upstairs. The external walls of the extension are of timber frame construction with an external corrugated metal cladding finish. The house is designed to have low environmental impact.

- (a) Discuss **two** advantages and **two** disadvantages of retrofitting the vernacular cottage shown.
- (b) With reference to the design shown, discuss using notes and freehand sketches, **three** features of the design that contribute to the house having a low environmental impact.
- (c) Discuss in detail, using notes and freehand sketches, **two** modifications to the house shown that would further reduce the environmental impact of the house. Justify your design choices.



7. Space heating is provided in a family living area by a wood-burning stove inset into a chimney breast, as shown. The chimney has been constructed to accommodate the stove and is located on a 200 mm internal solid concrete block wall. A 150 mm diameter cast iron flue connects the stove to the chimney flue. The living area has an insulated solid concrete ground floor with a 20 mm hardwood finish. The dimensions of the stove are: height 600 mm, width 550 mm, depth 400 mm.

- (a) To a scale of 1:5, draw a vertical section through the ground floor, hearth and chimney. Show the typical construction details from 350 mm below the finished floor to a level 300 mm above the top of the cast iron flue from the stove and include the connection to the flue liner in the chimney. Include **three** typical dimensions on your drawing.



- (b) On your drawing, show the typical detailing to provide an independent air supply to the stove.

8. The main bathroom located on the first floor of a dwelling house is shown.

(a) Discuss in detail, using notes and freehand sketches, **two** considerations that should be taken into account when locating a bathroom on the first floor of a house.

(b) Using notes and a freehand sketch, show the above-ground pipework necessary for the safe removal of waste from the following fittings:

- shower
- wash basin
- water closet (W.C.)
- kitchen sink on ground floor.



Include on your sketch typical sizes of the soil and vent pipe (*svp*) **and** of the waste pipe from each fitting.

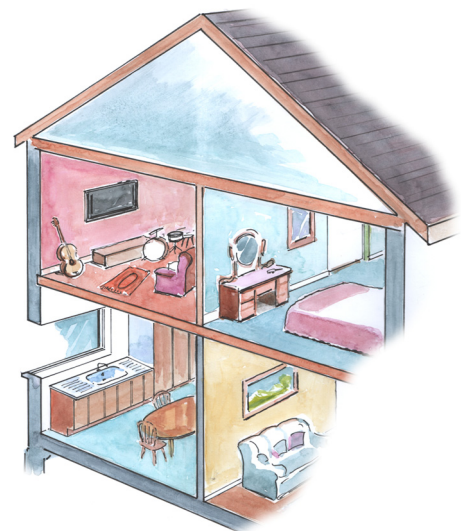
(c) Outline **two** considerations to minimise blockages occurring in a drainage system.

9. The owners have decided to convert an upstairs room into a family entertainment room. They are concerned that the sound from this room will be heard in the adjoining rooms upstairs and in the kitchen beneath.

(a) Discuss in detail, using notes and freehand sketches, how **each** of the following contribute to reducing the transmission of sound in a dwelling house:

- completeness
- flexibility
- isolation.

(b) The partitions are of standard timber stud construction and the first floor is a softwood floor on timber joists, with a plasterboard ceiling beneath. The partitions and the floor are to be upgraded to reduce the transmission of sound from the entertainment room.



Using notes and freehand sketches show a revised design detailing that will reduce the transmission of sound through the stud partition **and** the existing first floor. Specify the materials to be used and give their typical dimensions.

(c) Discuss **two** benefits that the sound insulation upgrades will have on the health and wellbeing of the occupants.

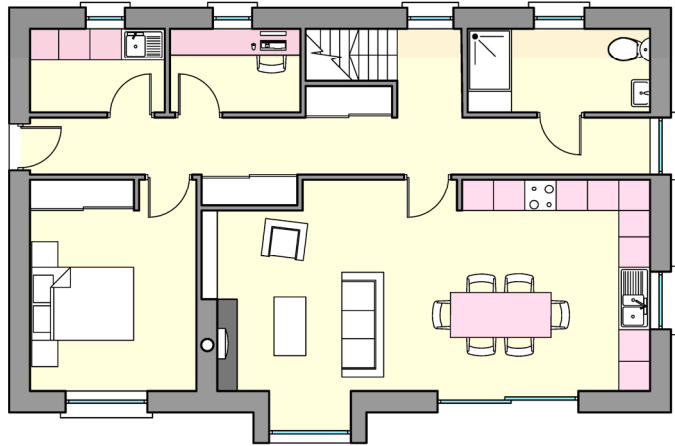
10. The drawing shows the draft design of the ground floor plan of a new dwelling house. The homeowners propose to install a Mechanical Ventilation with Heat Recovery (MVHR) system into their new home.

(a) Discuss in detail, using notes and freehand sketches, **three** considerations that should be taken into account when designing a MVHR system for a domestic house.

(b) Draw a line diagram of the given house plan. Show on your diagram the location of the MVHR unit and a typical layout for the system ducting. Indicate clearly the direction of the airflow in the ducts.

Describe how the MVHR system works.

Note: It is not necessary to show the furniture.



(c) Discuss **two** advantages of installing a MVHR system into a domestic house.

OR

10. “Worldwide, buildings are responsible for over 40% of the total primary energy use and related greenhouse emissions. Through standards and energy efficiency programs, several countries have succeeded in improving the energy performance of new and existing buildings. Designing and retrofitting electrical power systems to be energy efficient have been primary components in the effort to reduce energy consumption by the built environment.”

Adapted from: **Optimal Design and Retrofit of Energy Efficient Buildings, Communities, and Urban Centers.**

by Moncef Krarti.

Published by: Butterworth-Heinemann. ISBN: 978-0-12-849869-9

(a) Discuss the above statement in detail.

(b) Propose **three** best practice guidelines that would ensure all buildings are retrofitted in the most sustainable way possible to minimise their primary energy use and improve their energy performance.

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Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2021

Construction Studies
Theory - Higher Level
(240 marks)

Friday, 18 June
Afternoon, 2:00 - 5:00

- (a)** Answer **any four** questions.
- (b)** All questions carry equal marks.
- (c)** Answers must be written in ink.
- (d)** Drawings and sketches are 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. The sketch shows an external wooden door which is designed to facilitate ease of access for everyone to the dwelling house. The door is highly insulated with vertical sheeting on both sides. The wall of the house is a 400 mm wall of concrete block construction with a full-fill insulated cavity. The ground floor is a highly insulated solid concrete floor with a 20 mm tongue and groove floating hardwood finish.

(a) To a scale of 1:5, draw a vertical section through the centre of the door, the external wall and the ground floor. Show the typical construction details from the bottom of the strip foundation to a level 400 mm above finished floor level.

Show a width of 1.0 metre on each side of the door.

(b) On your drawing, show the typical design detailing that will prevent the formation of a thermal bridge at the threshold.



2. (a) Under **each** of the following, discuss in detail the duty of care that all workers have in maintaining high safety standards on a construction site:

- safety training
- personal protective equipment (PPE)
- vigilance.

(b) Discuss in detail **one** possible risk associated with each of the following:

- repairing a chimney stack
- overhead electrical cables
- on-site health & hygiene.



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

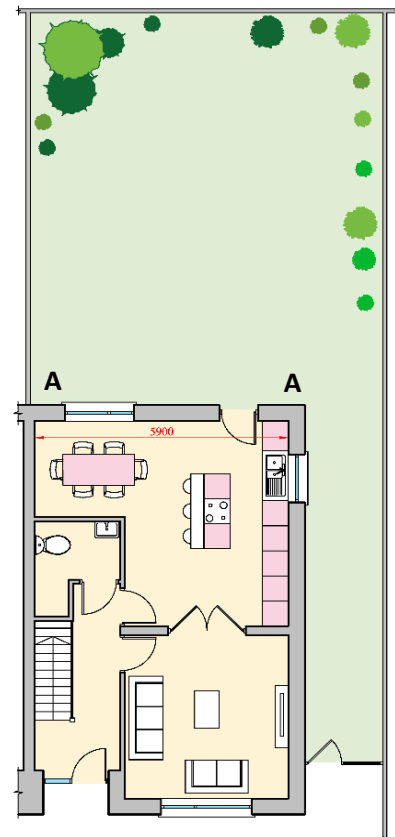
3. The drawing shows the ground floor plan of a two-storey semi-detached house and its rear garden. The rear wall **A-A** is south facing. The owners require a home office space, which will enhance health and wellbeing while working from home. It is proposed to build a single-storey office space, not greater than 18.0 m² in area, at the rear of the house.

(a) Discuss in detail, **three** design considerations that should be taken into account in the design of this home office space to enhance health and wellbeing.

(b) Using notes and freehand sketches, show a proposed design layout for the office space that incorporates each of the design considerations you outlined at **3(a)** above.

Justify your design choices.

(c) Discuss **two** advantages and **two** disadvantages of working from a home office.



4. (a) Using notes and freehand sketches, discuss in detail **each** of the following factors when selecting a site for a new house in a rural setting:

- availability of services
- existing trees and hedgerows
- site topography.

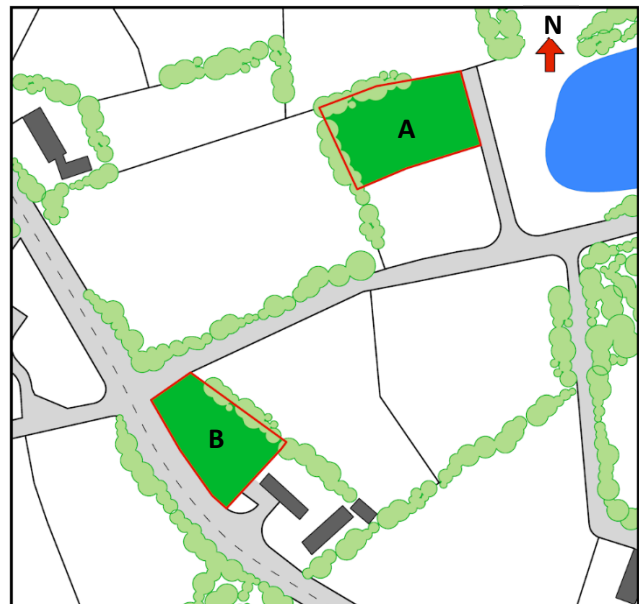
(b) Shown is an extract from a site location map. **A** and **B** are possible sites for a new house in a rural setting. Select your preferred site **A** or **B** and discuss **three** considerations you took into account when selecting your site.

(c) Draw a well-proportioned sketch of your selected site and the immediate boundaries.

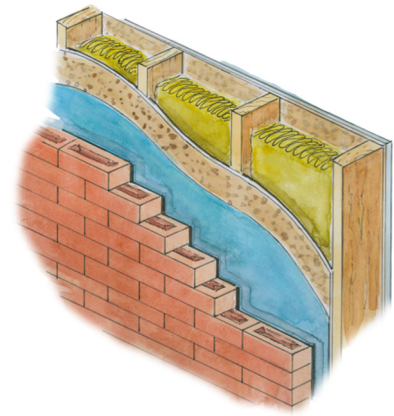
On your sketch, show a preferred:

- location and orientation of a house on the site
- layout of the road entrance and the driveway to the house.

For **each** of the above, justify your design choice.



5. The sketch shows a proposed external wall design detail for a new house of timber frame construction.



- (a) Calculate the U-value of the wall, given the construction has the following sequence and data:

External brick	thickness	100 mm
Clear cavity	width	50 mm
Orientated strand board (OSB)	thickness	9 mm
Timber stud	thickness	175 mm
Cellulose insulation between studs	thickness	175 mm
Orientated strand board (OSB)	thickness	9 mm
Plasterboard	thickness	12.5 mm

Thermal data of the external wall:

Resistance of external surface	(R)	0.048	m ²	°C/W
Resistivity of external brick	(r)	1.300	m	°C/W
Resistance of clear cavity	(R)	0.440	m ²	°C/W
Conductivity of OSB	(k)	0.130	W/m	°C
Conductivity of cellulose insulation	(k)	0.039	W/m	°C
Conductivity of OSB	(k)	0.130	W/m	°C
Conductivity of Plasterboard	(k)	0.250	W/m	°C
Resistance of internal surface	(R)	0.130	m ²	°C/W

Note: The timber studs need not be considered in your calculations.

- (b) It is proposed to redesign the above timber frame wall and upgrade its thermal properties to meet the Passive House standard by adding sheep wool insulation to the design of the internal leaf.

Given the thermal conductivity (k) of sheep wool insulation as 0.034 W/m °C, calculate the thickness of additional insulation required to achieve a U-value of 0.15 W/m² °C.

- (c) Using notes and freehand sketches, discuss why a moisture control layer and a vapour control layer need to be incorporated into timber frame construction.

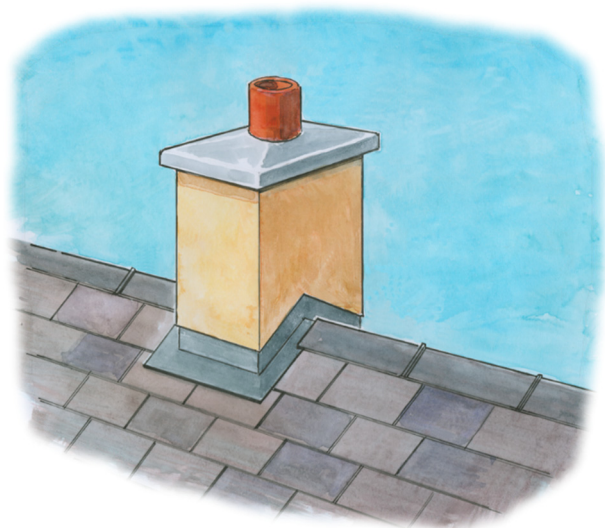
6. The elevation and ground floor plan of a terraced house constructed in an urban location are shown. The external walls are of timber frame construction with a rendered concrete block and cedar cladding finish. Central heating is provided using a renewable heat source. The house is designed to have low environmental impact.

- (a) With reference to the design shown, discuss using notes and freehand sketches, **three** features of the design that contribute to the house having a low environmental impact.
- (b) Operational energy use is an important consideration in designing for low environmental impact. Using notes and freehand sketches, discuss **two** features that could be added to the house that would further reduce its energy use.
- (c) Discuss in detail **two** advantages of designing a house that will have a low operational energy use when the house is built.



7. A chimney stack projects through a pitched roof at ridge level as shown. The chimney is of solid concrete block construction with a sand/cement render finish. The traditional cut roof has a pitch of 45° with a slate finish.

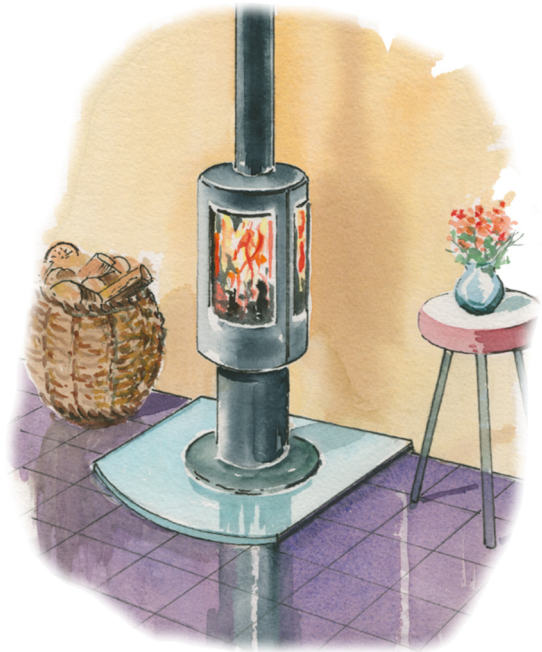
- (a) To a scale of 1:5, draw a vertical section through the centre of the chimney stack and roof structure. The section should show the typical construction details through the chimney stack, flue liner, chimney capping and portion of the roof structure.
On your drawing include **three** courses of slate at each side of the chimney stack.



- (b) On your drawing, show **two** typical design details to prevent the penetration of moisture at the junction of the roof and chimney stack.

8. The sketch shows a wood-burning stove used to provide hot water and central heating for a two-storey dwelling house.

- (a) Using notes and a single-line diagram, show a typical design layout for both the heating system **and** hot water system. Show **two** independently controlled heating zones, one on each floor. Include **three** radiators on each floor and give the typical sizes of the pipework.
- (b) Using notes and freehand sketches, describe **two** features that increase the efficiency of the heating system. Discuss the importance of **each** feature identified.
- (c) Discuss **two** advantages of installing an Air-to-Water heat pump system in the house as an alternative to the stove.

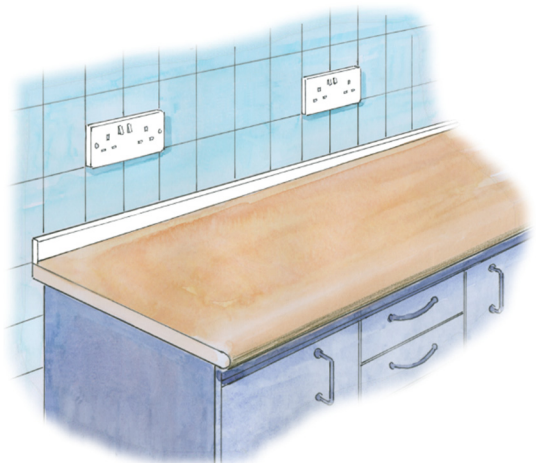


9. (a) Discuss in detail, **three** considerations when designing the layout for sockets in the electrical system of a domestic house.

- (b) Using notes and freehand sketches, show the design of a typical wiring layout for a ring main circuit to include:

- distribution board
- **three** electrical sockets.

Indicate the typical sizes and colour coding of the electrical cables.



- (c) The current Building Regulations require all new houses to have a renewable energy ratio (RER) of 20%. Discuss **two** benefits for the homeowner of generating their own electricity by using micro-generation to help meet this energy requirement.

10. The sketch shows the proposed design for a dwelling house in a rural setting. The design is inspired by vernacular Irish architecture.

(a) Discuss **two** reasons why solar overheating may occur in the house shown and discuss **two** effects solar overheating may have on occupants.

(b) Using notes and freehand sketches, suggest **two** ways to reduce the possibility of solar overheating while being sympathetic to the design of this house.

(c) Using notes and freehand sketches, discuss **two** features of the given house design that contribute to the house responding to its rural setting.



OR

10. “There is considerable potential to convert and reuse former schools, churches, mills and farm buildings in the county which will preserve these historic buildings which presently lie empty. This is an approach which underpins sustainable development in that it retains our built heritage while bringing empty structures into use. The reuse of these buildings can help to reduce the demand for new housing while also preserving the vernacular design of the area.”

Adapted from: **County Roscommon Rural Design Guidelines** by Roscommon County Council
Published by: Roscommon County Council

(a) Discuss the above statement in detail.

(b) Propose **three** best practice guidelines that would promote the reuse or repurposing of some existing buildings in Ireland.

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