Baccalaureate Support Event

Proposal and Plan

Exemplar 3 - Science

SCIENCE 1

Science: Interdisciplinary Project

Proposal

Candidate name	
SCN	
Centre name	
Assessor name	
Project title	"How can mankind survive long term on a planet which provides none of the essentials to support human life?"

Project outline (what it is I want to do and how will I go about it)

Produce a video demonstrating the wonders of spacesuits and how they provide a life support system for astronauts, especially with man planning to build a lunar base in the immediate future. I will gather information regarding the technologies used in the development of spacesuits (e.g. quantum tunnelling composite) and where possible create experiments demonstrating these technologies in action and film them. I intend to create a questionnaire to hand out to a cross section of both standard grade and higher science classes, allowing me to gauge their interest in space and how much knowledge they currently have (from how many people have been in space, to the temperatures the human body would have to endure on the moon). Following my presentation, I shall hand out a follow-up questionnaire to demonstrate if their knowledge or interest has increased. I will create scenes showing where these technologies are important, for example movement in the gloves of a spacesuit (again quantum tunnelling composite) and also have written information/narration where appropriate on the video. I will produce a thumbnail plan for the video once I have established my main points of information and the experiments which I plan to execute. Then I will carry out the filming of the experiments/ scenes, followed by the editing. On completion of my experiments I will produce a written copy of my results which will be available to anyone who wishes to go into greater detail on what I proved.

Reasons for choosing this project (eg personal interest, future plans, links to other subjects I am studying/ have studied)

I have always been interested in space and since experiencing the Scottish Space School, my interest has flourished. Ideally, in the future I would like to pursue a career in NASA and the space program and I have a large interest in Physics and the spacesuit involves lots of Physics. It would also be appropriate since NASA has reached some huge milestones (40 years of Apollo and the 500th person in space) and is about to reach others (the end of the shuttle missions and the beginning of sending man back to the moon and building a lunar base) I like to encourage younger students to pursue their own ambitions and my video would be the perfect way to introduce them to a different aspect of space which I am sure they won't know much about and encourage them to attend the Scottish Space School. I have decided to produce a

video because I am very interested in making videos and editing and I enjoy doing this. I enjoy the physics behind the area I have chosen to research, but I am also interested in the media and economic side to it too.

The broad contexts this project will cover are

☐ Citizenship
☐ Enterprise
☐ Employability- The completion of this project should allow me to gain a huge insight and understanding into the engineering involved in the human space industry, which is the field in which I hope to achieve a job in.
☐ Economic development- The space industry employs a great number of people from across a broad spectrum of sciences, engineering subjects and psychological areas. Through the development of such things as spacesuits, it ensures this large industry continues to develop and retain employment.
☐ Sustainable development

Learning environments I will access are:

NASA experts in the field of spacesuit design. (I have the e-mail address of Heather Paul, one of the engineers who works on the Space Suit and have already been in contact with her and she has offered a support frame for me to use)
The internet.
Books from the school library and Dundee University library- on space and the various technologies involved. (Both of these will be essential for providing me with information regarding the space suit and will help me decide which direction to take with my experiments)
Local Universities, including Dundee University and St Andrews University (They will be key in undertaking my experiments, as they can provide the facilities that my school cannot. They are generally open to students using their facilities for studying and are usually accommodating)
The Commercial Pressure Chamber in Dundee/ or at Nine Wells Hospital.

The skills I will develop and/or improve in the course of this project are

Application of subject knowledge and understanding.
-I will have to apply knowledge of cameras and video editing software to produce my final product of an interesting and informative video.
-I will need to understand how certain parts of the spacesuit work (i.e. how different materials have different stress and strain limits and how this protects the astronaut) and thus apply this knowledge and understanding into video format making it easily understandable for the viewers.

Research skills – analysis and evaluation.
-From the vast range of information I gain from research, I will have to select the relevant information for my project and evaluate whether it will make feasible experiments for me to carry out.

I will also make a questionnaire and compile the results I gain from the various classes I choose to analyse.

Interpersonal skills – negotiation and collaboration.
-I will have to negotiate with the two local universities to find out which would be best for carrying out my experiments. Collaboration will be essential with Heather Paul (NASA) and another student who is going to Johnson Space Centre (to gain video footage)

Planning: time, resource and information management.
-I will have to establish a timeline of when certain resources will be available (i.e. pressure chamber) and plan the tasks which need to be done prior to this around it. I will need to manage the information gained from my research meaning I can gain best use of it.

Independent learning – autonomy and challenge in own learning.
-The majority of my research and experiments, alongside my planning and motivation will be independent and through this I can learn to work on my own and not rely on the input of others for the completion of my project.

Problem solving – critical thinking: logical and creative approaches.
-My video footage/editing will need to be creative, thus drawing in the audience and grabbing their attention. I will need to hurdle any issues which arise involving outside parties, so that my project can be completed on time. Through this the development of problem solving skills will be essential.

Presentation skills.

- I will be presenting to a fairly large audience, therefore it must be viewer friendly and any important information must be obvious and easy to understand.

Self evaluation – recognition of own skills development and future areas for development.

- I will regularly refer to my skills checklist and continuously audit this, evaluating myself and finding out which skills I need to work on.

Assessor comments

Your proposal clearly describes your project aims. The project is of obvious personal interest to you. You have identified opportunities for skills development & your identification of broad contexts for the appliance of Science is clear & well reasoned. There are clear connections made between your project and the wider world. You have clarified your project aims & produced a proposal with clear & creative goals. You have indicated how you will go about achieving these. There are clear links between Physics & Engineering aspects of your project and with Media. Your experiments should develop links with Biology.

Proposal approved	Yes	**Further work required**	No
Candidate signature		**Date**	10/9/09
Assessor signature		**Date**	10/9/09

Science: Interdisciplinary Project

Plan

Candidate name	
SCN	
Centre name	
Assessor name	
Project title	"How can mankind survive long term on a planet which provides none of the essentials to support human life?"

Is this a group project? yes ☐ no ☑

If a group project, what will your role or responsibilities be?

Timescales (start, finish and milestones)

See Gantt Chart attached.

Planning – state how you are going to meet the agreed objectives of your project

I will meet the agreed objectives of my project by a combination of careful planning and having an acute awareness of the timescales for each task and have individual sub plans.

*Proposal
*Planning
*Questionnaire Hand-out- To establish what my target audience already know, so that my presentation can plug the gaps in their knowledge and be worthwhile, rather than just telling them things they already know.
-development of questionnaire
-questionnaire test, using a cross section of 12 adults from a badminton club. This will show me whether my questionnaire is understandable
-Approach the print room and request 120 copies of my questionnaire
-Negotiate with 3 teachers, each from a different science, who teach both higher and standard grade classes, to convince them to hand out my questionnaire during one of their lessons.
*Questionnaire results
-Gather all my questionnaires in.
-Establish whether there is wide-spread knowledge regarding space and spacesuits.
-Analyse data for each question, showing whether my target audience know about spacesuits. Then I will know specifically what information will be worthwhile presenting to them, as I will have pin pointed the areas of misinformation and lack of understanding.

*Research- I will be largely using the internet as the books available do not contain information which is useful to me. One website in particular which will be of great use to me will be the NASA website because it has an online interactive spacesuit and will be the closest I am able to get to a spacesuit.
-Materials involved in the design of spacesuits and how the layers are put together to form a spacesuit. The different jobs done by each material. How the material in spacesuits protects the astronaut.
-Quantum Tunnelling Composite (Q.T.C) its use in Spacesuits.
-Pressure in space, what it is and the biological effects it has on the astronaut.
-Temperatures in space. To find out what temperatures spacesuits must be able to combat to protect the astronaut.
-Mirrors. What purpose they have on spacesuits.
-Sun visor. How it varies from sunglasses on earth, since the suns rays will be far stronger.
-Cost of spacesuits. How much it would cost to buy a spacesuit.
*Experiments
-Biological effects of pressure on the body- Visiting the pressure chamber I will use balloons as an expandable material representing the lungs and water as a representative of the fluids in the body, the chamber will lower the pressure to those similar to space, and the balloons and water will demonstrate what would happen toan astronaut subject to space without a spacesuit. This will show why a spacesuit is so incredibly important to space survival.
-Using Q.T.C I will show how astronauts can control internal switches without having to expose their bodies to space by removing their gloves.
-Using Young's modulus I will see the strains that the material used in spacesuits can be subject to without ripping or tearing as this would have disastrous effects.
*Experiment write-up
I will display the outcomes of my experiments in paper form as mini investigations, to be available to people wishing to view them.
*Scene Filming
-Various scenarios acted out. From dust speeds relative to space, to the lack of movement faced by astronauts. A person will represent an astronaut and comparative scenarios will be created.
-The actor will demonstrate the role that a spacesuit plays in space and show its necessity. They will also identify the key features which are needed in the design of the spacesuit to make it function properly.
-**Interim Review** – this will allow me an opportunity for feedback and support from my course tutor. However throughout the project I will gain continuous support and feedback from my course tutor through weekly meetings. My fellow colleagues and my other teachers will also be supporting me throughout my project.
*Editing
*Video Completion
***Presentation**
-Video, written experiments and speech.
*Preparation for Viva
*Viva (22/02)
*Preparation for Folio (28/02)
*Hand in Folio (5/03)
I will be continually evaluating my project after each stage by referring to both my proposal and plan to see that I am undertaking everything I am supposed to be. From

this I will be able to gauge how successful I have been with each task. For example, I will know if I have been successful with my research by how much information I have to turn into film footage.

My project will include aspects from various disciplines, from the physics basis, to biology (with the biological effects of space without spacesuits), mechanical engineering (stresses and strains that neoprene can take), and media (my video presentation).

Resources (people, materials, places)

I plan to utilise various resources, from people, to places and even materials. Some of the resources I intend to use include:

- 6 classes who are studying one of the three sciences, to complete my questionnaire. By doing this I will need to negotiate with at least 3 different class teachers, to allow students to complete this during class time.
- I will be in contact with Heather Paul, an engineer from NASA.
- Dundee University library and possibly labs, to execute my research and experiments.
- The Commercial Pressure Chamber in Dundee (For Pressure experiment *see "planning, experiments")
- Experimental equipment will be needed to allow me to gain results. I will need to use the pressure chamber. Young's modulus set-up which I will be able to use in school. A Q.T.C set-up which the school also have.
- I will need to use cameras, tripods, filming tapes, actors, props, computer and video editing software. (I will either use the schools equipment, or my own. Most likely, I will be using "Windows Movie Maker" to produce the final video, which is free on any P.C)
- Research Books from Dundee University Library including report about NASA.
- The internet, I will use various sites including NASA website, Scientific American and astronautix.com.

Research methods (contacting companies, surveys, focus groups, experimentation)

- I will be contacting NASA for direct information regarding how spacesuits work. More specifically I will be contacting one of the spacesuit engineers.
- I have created a questionnaire (which has been tested by a cross-section of adults from my badminton club, who are a variety of ages) asking subjects questions about space, spacesuits and their opinion on space travel, to gain an insight into how much knowledge my target audience have on the subject which will be given out to science classes. (SG and Higher, chemistry, physics and biology)
- University Libraries and the internet will be integral to my research. I will need to use them to learn about the properties of space (temperatures, pressure effects etc) and about how spacesuits work (materials, cooling systems)
- I will be carrying out experiments, including one involving pressure effects. For

this experiments, I will attempt to simulate the effects of low pressure on water and on the human body (using balloons to represent lungs), which will show why humans need to wear a spacesuit to survive for long periods of time.

Presentation

- **Who do I think will benefit from listening/reading/looking at my presentation of my project findings/product?**

The 4th and 5th year chemistry, physics and biology classes who I present my video, should hopefully gain an interest in space and its associated industry. With their interest they may chose to participate in the 2010/2011 Scottish Space School, which is a life changing experience for everyone involved.

- **What methods are appropriate to the audience (for example demonstration, presentation software, websites, oral, report, piece of theatre, dvd, wiki/blog or any combination)**

I will be using a video presentation to convey my information- which should capture my required audience's attention and keep them interested throughout. To be available to a widespread audience and the younger generation, I will be uploading my presentation to www.youtube.com.
I will need to be able to convey my information on two levels, from the Advanced Higher/ Higher science language, to language for my video audience, this could be one of the hardest challenges that I will face throughout my project.

Dependencies (what is required for your project to go ahead ie reliance on other people or resources, steps in plan that must be completed before starting the next step)

For my project to be successful, I am fairly reliant on:
My NASA contact (Heather Paul, spacesuit engineer)
Commercial Pressure Chamber, to carry out my pressure experiment.
The Internet
School Labs
I will need to rely on my friends being willing to appear in my video.

Contingencies

Any anticipated problems?	My plans for overcoming the anticipated problems.
1. Lack of contact with NASA.	1. Do more independent research, using the internet.

2. Unable to gain access to the pressure chamber. 3. Issues with weather which could hamper my progress when filming for my video. 4. Unable to find copyright free photos.	2. Use the pressure chamber at Ninewells Hospital. 3. Postpone filming until a more appropriate time with better weather. 4. Use photos from the NASA website, which are available for anyone to use.

Method for recording own skills development and future areas for improvement

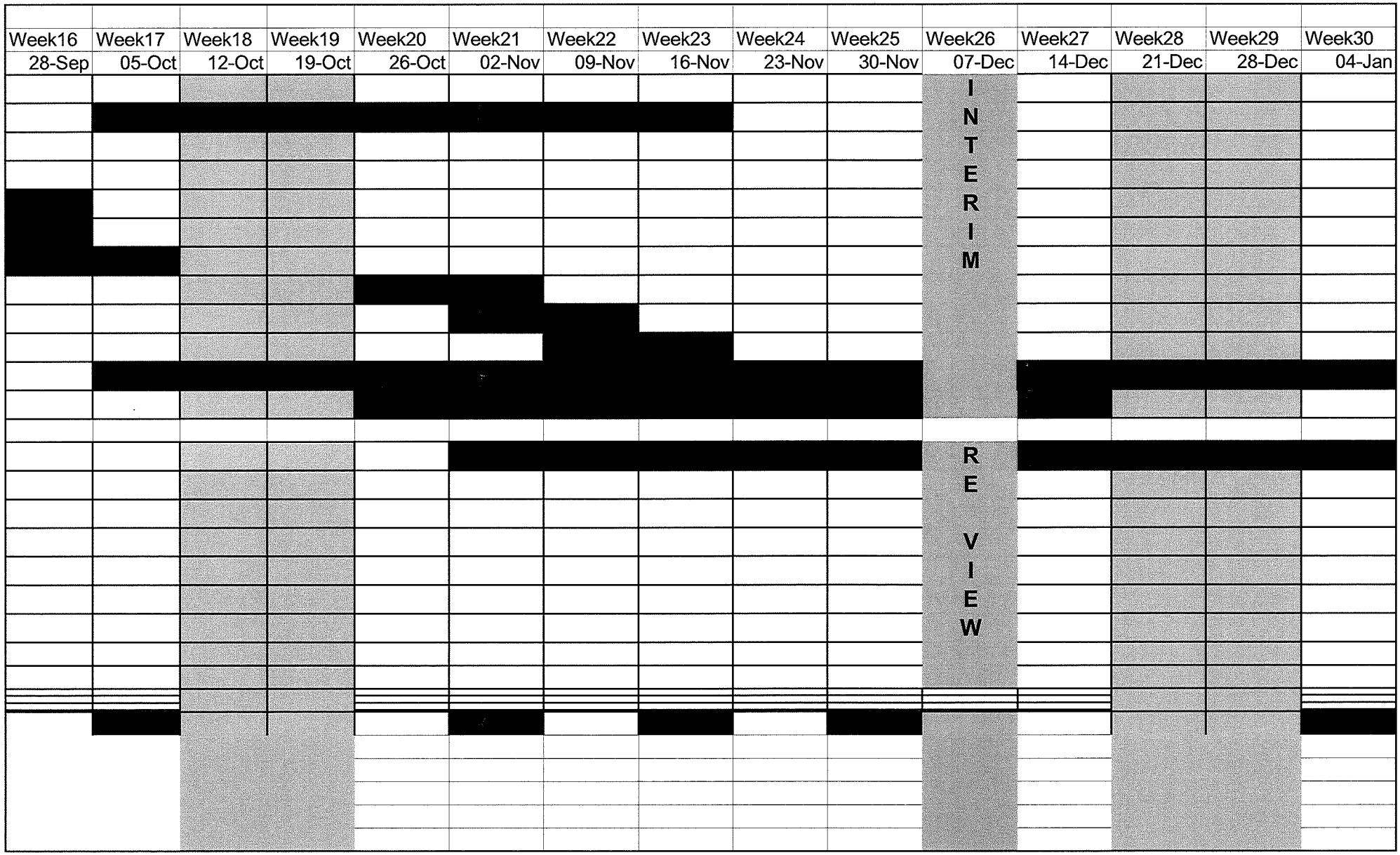
Baseline audit. I will record my skill level before my project and then continuously throughout it, to gain an insight into where my skill levels are lacking. To achieve a higher level and improve my skills in the identified areas, I will track my baseline audit and spend more time focussing on the aspects of my project which involve the skills which need more work. I will also go out of my way to do things which will improve my lower level skills.

Assessor comments

Your project now provides opportunity to satisfy all criteria. You have taken on board all comments – have brought out evidence for opportunities for skills development, emphasised how the project is truly interdisciplinary, added questionnaires to inform the style, level and content of your video. It is clear that you have thought about possible challenges & solutions.

Plan approved	Yes	**Further work required**	No
Candidate signature		**Date**	23/11/09
Assessor signature		**Date**	23/11/09

GANNT CHART -IP															
	Week1	Week2	Week3	Week4	Week5	Week6	Week7	Week8	Week9	Week10	Week11	Week12	Week13	Week14	Week15
Activity	15-Jun	22-Jun	29-Jun	06-Jul	13-Jul	20-Jul	27-Jul	03-Aug	10-Aug	17-Aug	24-Aug	31-Aug	07-Sep	14-Sep	21-Sep
Space School															
Brainstorming ideas															
Contacting NASA															
Proposal															
Plan															
Questionnaire development															
Questionnaire test															
Print Questionnaire															
Hand-out Questionnaire															
Recieve Questionnaire back															
Research															
Experiments															
Scene Filming															
Editing															
Leaflet Making															
Video Completion															
Presentation															
Viva Prep															
Viva															
Folio Prep															
Folio Hand-in															
Discussion with Tutor															
Self-Evaluation															
Once a week															
Non-extendible deadline															
Project work															
Holidays															


Week16
28-Sep
Week17
05-Oct
Week18
12-Oct
Week19
19-Oct
Week20
26-Oct
Week21
02-Nov
Week22
09-Nov
Week23
16-Nov
Week24
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Week28
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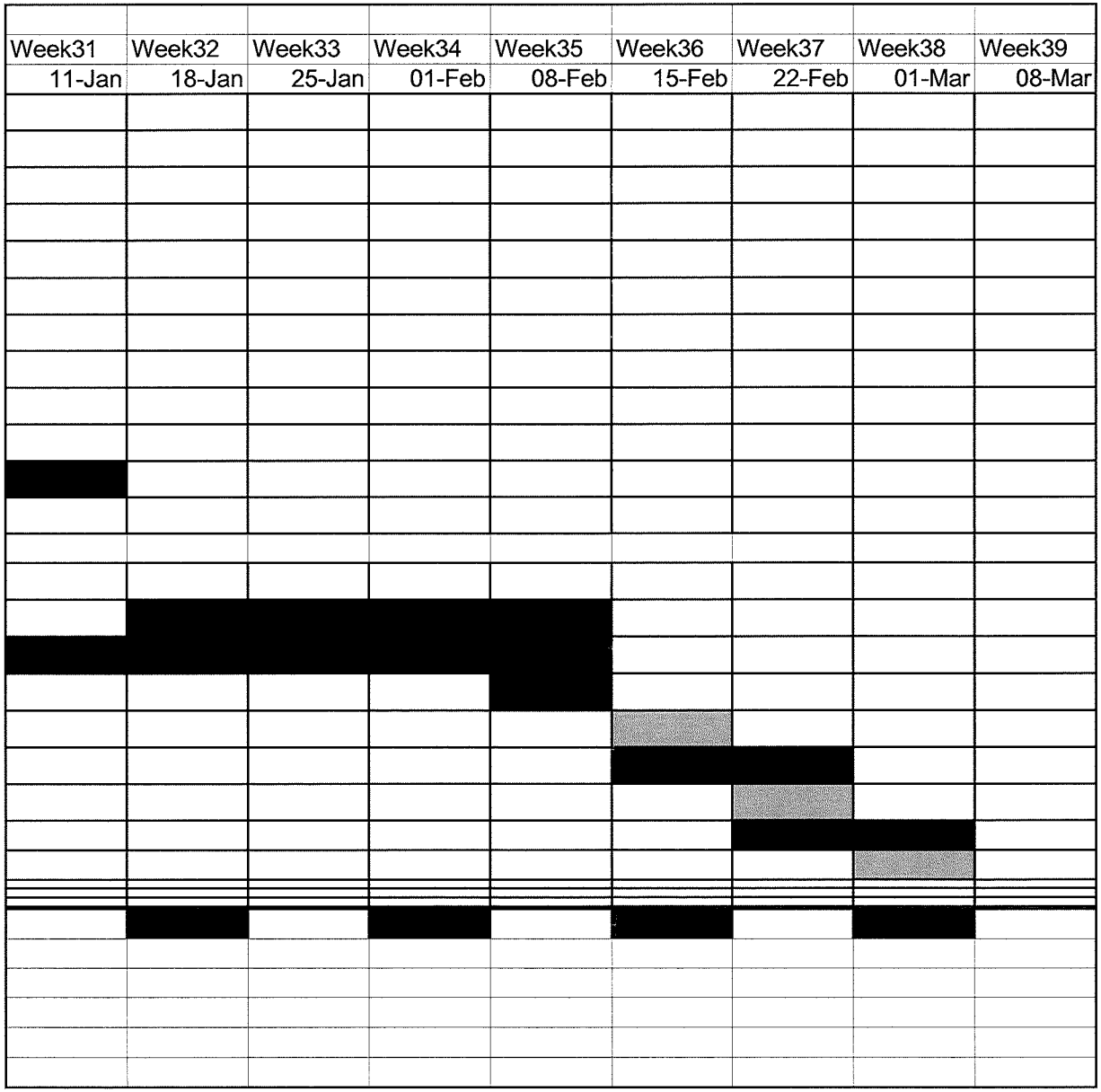
Week29
28-Dec
Week30
04-Jan
INTERIM
REVIEW


Week31
Week32
Week33
Week34
Week35
Week36
Week37
Week38
Week39
11-Jan
18-Jan
25-Jan
01-Feb
08-Feb
15-Feb
22-Feb
01-Mar
08-Mar