Online summative assessment: ExamOnline

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Online Examinations (e-Assessment)

Advantages of e-Assessment

- Automatic marking
- Immediate feedback
- Increased flexibility

Question types:

- Item-banked, closed form, very often MCQ
University Examinations

- Often consist of essay / extended answer / short answer questions
- Some questions require drawings and calculations as part of the process
- Require detailed human marking, often involving multiple markers

So there is a disconnect between e-Assessment platforms and the requirements of University examinations

THE ANSWER - EXAMONLINE

- Online assessment system specifically designed to deliver high stakes summative assessments
- Computer marked question types (multiple choice, true/false, best/worst, multiple answer, gap-fill etc.) … plus
- Specific support for University exams: human-marked extended answer questions, with sketches/diagrams.
August 2016
ExamOnline identified and purchased

November 2017
ExamOnline trial mock exam (n=16)

December 2017
IMMU10003 Exam taken online (n=23)

March 2018
Spring
Plant Sciences (n=3) Immunology (n=23) MSc Biotech (n=15)

November 2018
Nov/Dec
Immunology 3 practical test (n=107) All Immunology Honours S1 courses (n= 20 x 4)

Spring 2019
Plant Sciences (n=6) Immunology (n=20) Biochemistry (n=7) MSc Biotech (n=16)
Splicosomes are found within eukaryotic cells and are used to cleave introns from mRNA strands to form a mature RNA strand containing only exons (genes that shall be expressed). The purpose of these is to give more variation between genes as different combinations of genes can be synthesised.

An mRNA strand must be cleaved of it’s introns before traversing through the nuclear pore.

Splicing occurs on a mRNA strand, small nuclear ribonucleic proteins bind with 5' and 3' splice sites which are specific sequences the snRNP's recognise and bind to, the 3' site is slightly behind the 2nd exon, this is to allow the lariat to form. The snRNP's are bound to the sites and a bend occurs in the mRNA and the snRNP's combine into a splicosome which initiates the cleaving and combining of the mRNA intron loop and also the combining of the now matured mRNA strand. The exons are bound and the splicosome breaks off and the lariat is formed and then released after the 5' and 3' of it join. The lariat is broken down and recycled and the splicosome disassembles and is ready to perform again.

Generally markers are pleasantly surprised by how well they take to on-screen marking. But not all…
Hand Drawn Sketches/Diagrams

- Pre-printed sheets, each with a unique ID number, downloaded from ExamOnline
- Sheets are provided to candidates
- Candidates click on a button in the interface to insert a sketch, enter the ID from the paper.
- The number is checked for validity (Modulo 97,10 check digits) and then embedded in the answer.
- When the test is finished, the drawings are scanned, uploaded, and automatically matched to the candidate’s answer – using QR code.
4.

**SECTION B**

Ubiquitin (Ub) is a small, globular protein, found throughout all eukaryotic cells, with its name derived from the word 'ubiquitous'.

a) Draw a sketch of a protein substrate attached to a chain comprising two ubiquitins, which are linked to each other via a Lys63 linkage.

b) Protein ubiquitylation is catalyzed via E1, E2 and E3 enzymes. Outline the reactions catalyzed by the E1 ubiquitin-activating enzyme.

[21 marks]

[See drawing labelled 16-18-48-39 when marking this answer]
a) **Ubiquitins** have 3 forms - multi ubiquitin chains, monomeric poly ubiquitin chains and poly ubiquitin chains. The chain type affects the fate and function, which **ubiquitin** binding domain it will interact with and the chains' **conformation**. For a chain to form with another, **Ub** must have an **N** terminal **Met** (Comment by answer Carb: **tack**). **Nontypical polyubiquitin** chains only have a single linkage type whereas **heterotypic** can have mixed types or a **branch** type chain. **Ub extended at 2 or more lysines** **lysE3** has an extended **conformation** (similar to linear chains) exposing the **Ile44**.

**Enter the drawing ID into your answer in ExamOnline, or IT WILL NOT BE MARKED.**
A typical Edinburgh Biology student’s written answer…
Question: Question 3: Discuss the importance of the antigen processing pathways used to present self and pathogen antigens to T cells, on both MHC and MHC-like molecules.

MHC encoded genes make up for roughly 0.1% of the genome, approximately 4M of DNA, and present antigen to activate CD4 and CD8 T cells.[comment by marker David Cavanaugh marker: MHC proteins: present, not the genes!] Firstly, MHC-I genes which are encoded on all nucleated cells encode[comment by marker Matt Taylor: unclear phrasing] cytosolic, antigens to CD8 T cells in order to activate their cytolytic killing.[comment by marker David Cavanaugh marker: I think you mean that MHC-I is expressed on all cells, and that they present cytosolic antigens, but the way you have written it is unclear] These consist of 3 alpha subunits and a B2M, transmembrane alpha and membrane distal alpha 1/2 have an enclosed peptide binding pocket, which preferentially present 9 (also peptides between 8-10) peptides[comment by marker Matt Taylor: unclear phrasing]. [comment by marker David Cavanaugh marker: Again, I think you mean 3 alpha domains, with 1 and 2 distal from the membrane and involved in peptide binding, but this is also written in a confused way] these are also associated with the presentation of cross-presented antigens in the case of APCs, particularly DCs which uptake via macroinocytosis or phagocytosis to present and activate naive CD8 T cells. MHC-II molecules consist of a heterodimer of alpha and beta chains, with alpha/beta 2 membrane proximal both transmembrane, and alpha/beta-1 having an open peptide binding cleft able of presenting 13-18 amino acid peptides to CD4 T cells.[comment by marker David Cavanaugh marker: almost right - although again could have been phrased better] These are restricted to antigen presenting cells, highly upregulated on DCC activation, presented at intermediate levels on macrophages (more to show the continued presence of antigen at tissue) and B cells for T cell licensing, as well as the brain microglia, thymic epithelial cells. Finally, antigen presentation can be done by non-classical MHC-Ib molecules on the MHC locus (Chr6p21.2) and also non-MHC encoded molecules, such as the lipid-presenting CD-1 molecules on Chr1q23.1.[comment by marker David Cavanaugh marker: good] Finally the non-MHC encoded CD1 family, Ch1q23.1, which have alpha1/2/3 subunits and are B2M associated, include group 2 (CD1d) and group 1 (CD1a/b/c/e) which are associated with binding different glycolipids in their partially enclosed but larger than MHC-I peptide binding cleft. The lipids they bind vary but are generally associated with being amphiphatic, but a flexible alliphatic hydrocarbon chain binding the cleft and a hydrophilic head being extruded out to bind alpha/beta, gamma/delta and NK T TCRs. these TCRs don't appear to be any different from normal TCRs, but CD1 restricted TCRs have been found both C4+/- and C4+-/. CD1a/b/c are associated with binding to lipids from bacterial membranes. CD1 molecules are loaded in the ER with self-lipid by microsomal triglyceride transfer protein, where they get trafficked to the PM, and then recycled. CD1a is associated with recycling to a sorting endosome, CD1b/mCD1d to MTOs/lysosomes, and indeed CD1c to both, whereby they exchange their lipids for microbial ones by saponins.

...and his answer in ExamOnline

Mark: 72

Marked by David Cavanaugh on 11/01/2018 02:29 PM
ExamOnline keeps a synchronised copy of candidate answers in memory, on the server, and on the local hard drive.
For a small (n=25) course:-

- 8-10 hours of admin time/exam creating, sorting and collating papers/answers/marks

- 8-12 person-hours/day delivering and collecting exam papers
Begin forwarded message:

From: <xxxxx@sms.ed.ac.uk>

Subject: Exam

Date: 11 December 2018 at 13:47:41 GMT

To: CAVANAGH David <David.Cavanagh@ed.ac.uk>

Hello David!

I don’t really know if you are looking for feedback but I just wanted to say the typed exam worked really well for me personally. Having the clock there, being able to type in a quiet room with a comfortable seat proved to work so well, I could focus and I didn’t notice other people typing away at all! The system works great and I’m glad we got to use it.

Best wishes,
Summary

• ExamOnline fulfils the role we asked for
  – Clear text – quicker marking
  – Allows hand-drawn diagrams/equations to be integrated into each answer
  – Online marking – two markers can view/mark simultaneously (soon)
  – Quicker feedback possible – release of marked script without mark
  – Online monitoring of markers progress – easier for COs and admin

• Students welcome the use of it
  – Editing text
  – More relaxed surroundings
    • Students can enter exam hall well in advance and sit at any desk
    • Biology staff less scary than university invigilators
  – Most report quicker typing speeds than writing

• The 5 P’s are important – especially in scheduling tests
  – Consistent rules about candidate ID, logins, passwords *MUST* be enforced
  – Paper back-up needed in room (extended power failure?)
  – Run practice tests for 10 mins before real test
It's just a much better and more comfortable and more practical format for exams in the 21st century.

The ExamOnline system definitely helped reduce my exam anxiety overall—although I was initially sceptical about whether I'd be able to type fast enough if keyboard sounds would be distracting etc, I found the whole experience a lot more bearable than sitting in a drafty exam hall, and I was surprised by how easy it was to adapt to typing exam answers.

I unequivocally endorse the use of ExamOnline in the future. It greatly enhanced my exam experience and I feel that I would have done better on previous exams if its use had been allowed.

This form of examination makes sense in this modern age; In my previous 3 years of University I would never hold a pen unless sitting an exam. Instead, typing the exam was a much more natural, modern and appropriate form of examination.

It's simply brilliant. I cannot believe other students from different courses are not benefitting from this excellent technology. In our current society exams are timed and sadly the essay you write under those conditions doesn't reflect your knowledge of the time. This technology alleviates that pressure as a majority of students are faster typers.
END