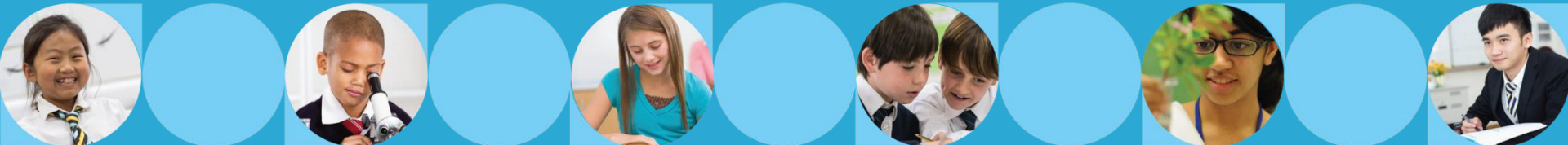


Developing valid, reliable and accessible assessments

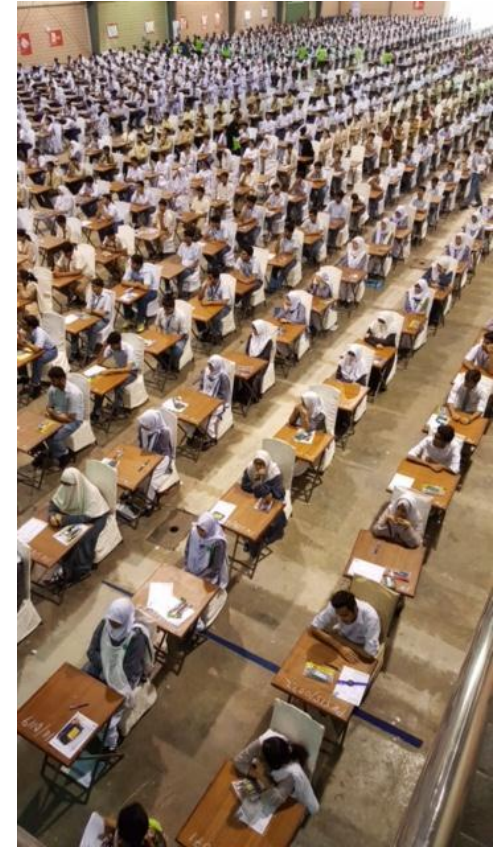
Russell Wallington
Group Manager (Sciences), Assessment

18th September 2018



Overview

- ▶ Producing fair assessments
- ▶ Validity, reliability and accessibility
- ▶ Question paper production process
- ▶ Discussion
- ▶ Support for teachers
- ▶ Any questions?



Producing fair assessments

- ▶ **Fair tests require:**
- ▶ An appropriate syllabus
- ▶ Valid, reliable and accessible assessments
- ▶ Fair and consistent marking processes
- ▶ Robust and dependable grading decisions



Validity, reliability and accessibility

- ▶ **Valid assessments:**
- ▶ Test what they are designed to test
- ▶ Based on what candidates have been taught
- ▶ Minimise construct-irrelevant variance
- ▶ Are of appropriate difficulty
- ▶ Mark scheme matches the question paper
- ▶ Affect the reliability



Validity, reliability and accessibility

- ▶ **Reliable assessments:**

- ▶ Are of comparable standard year-on-year
- ▶ Produce similar outcomes
- ▶ Are marked reliably and fairly
- ▶ Affect the validity

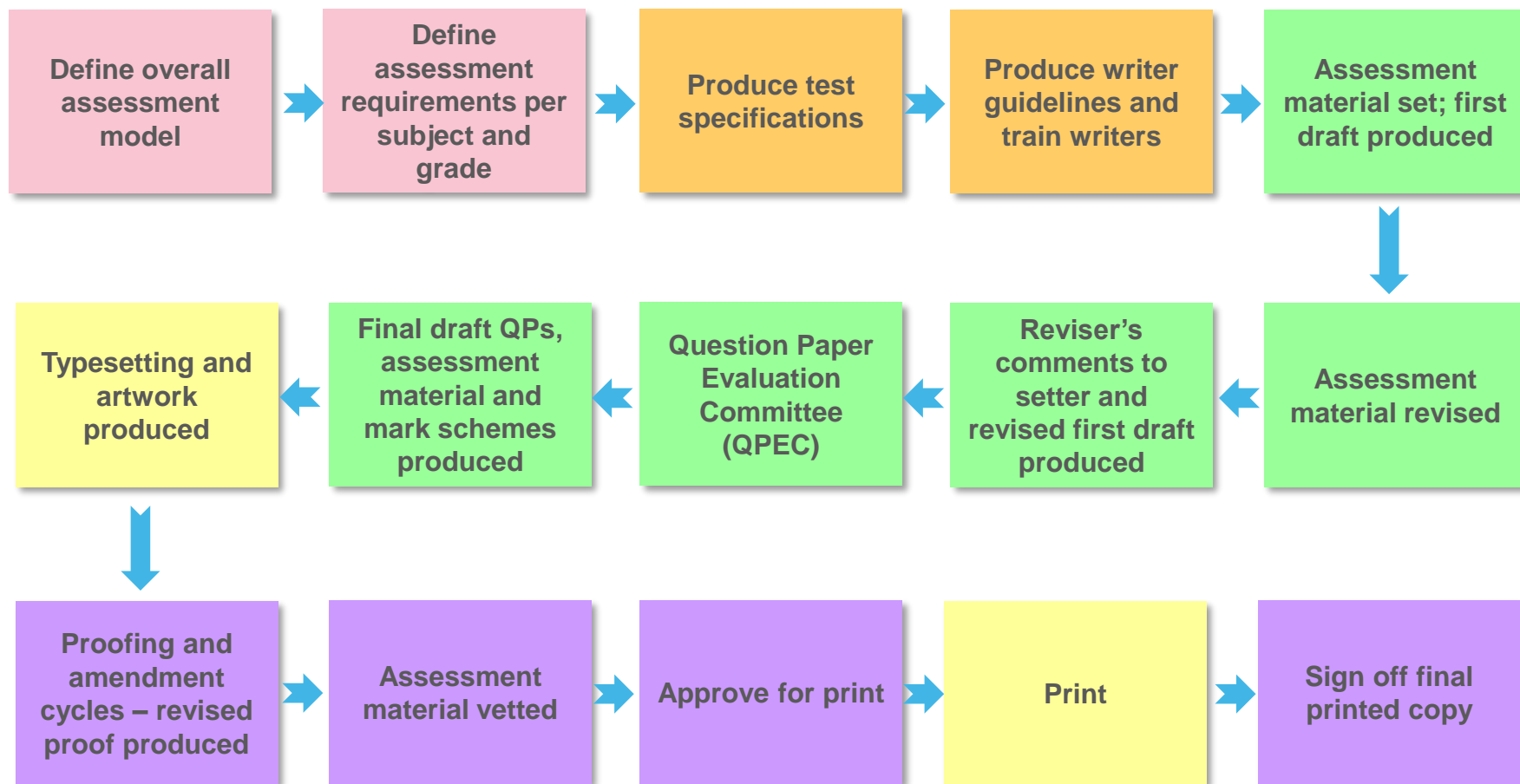


- ▶ **Accessible assessments:**

- ▶ Have appropriate linguist demand
- ▶ Are unambiguous
- ▶ Are free from redundant information
- ▶ Are free from cultural bias

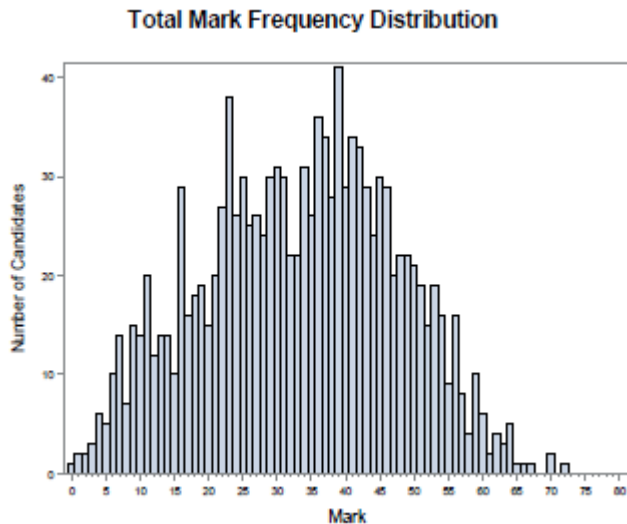


Question paper production process



Discussion

- ▶ **Handout 1** – IGCSE Physics, 0625/31, J17, Q4 (final version)
- ▶ **Handout 2** – IGCSE Physics, 0625/31, J17, Q4 (draft version)
- ▶ **Handout 3** – IGCSE Physics, 0625/31, J17, Q4 (Item Level Data)



4 Fig. 4.1 shows a hydroelectric power system located in the mountains.

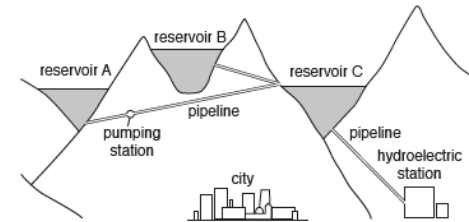


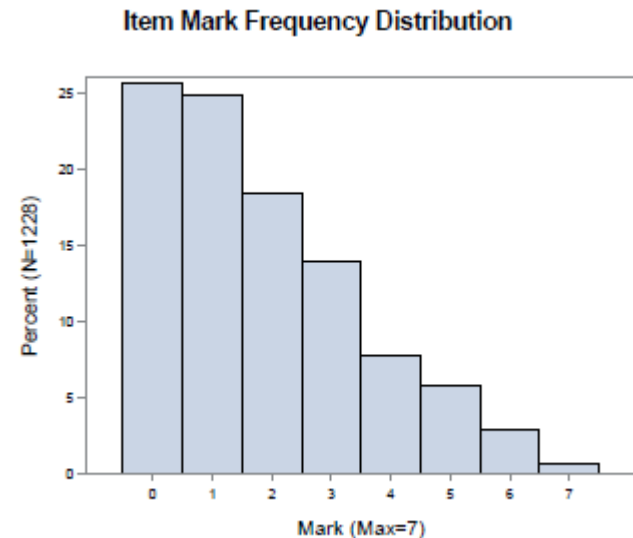
Fig. 4.1

- (a) The reservoirs store energy.
State the terms used to describe the energy stored in the reservoirs.
..... [1]
- (b) Describe how the energy stored in reservoir C becomes useful energy for the city at the hydroelectric station.
.....
.....
.....
.....
.....
.....
..... [3]
- (c) Some of the stored energy is wasted. Explain what happens to this energy.
.....
..... [2]
- (d) Water from reservoirs A and B may flow into reservoir C. It is more efficient to fill reservoir C using water from reservoir B only.
Suggest a reason for this.
.....
..... [1]

[Total: 7]

Discussion

- ▶ **Handout 4** – Q4 Performance Statistics (n = 1228)
- ▶ **Facility** = fraction of candidates who scored the marks (>0.80 = easy; <0.20 = hard)
- ▶ **Omit** = fraction of candidates who did not answer (0.20 is high)
- ▶ **Discrimination** >0.30 shows good discrimination (against performance on the whole question paper)
- ▶ **Handout 5** – Q4 Item Characteristic Curves (n = 1228)



Discussion

▶ Using the right command word

▶ Define...

▶ What (is meant by)...

▶ State...

▶ List...

▶ Explain...

▶ Describe...

▶ Suggest...

▶ Calculate...

▶ Determine...

8.4 Glossary of terms used in science papers

This glossary (which is relevant only to science subjects) will prove helpful to candidates as a guide, but it is neither exhaustive nor definitive. The glossary has been deliberately kept brief, not only with respect to the number of terms included, but also to the descriptions of their meanings. Candidates should appreciate that the meaning of a term must depend, in part, on its context.

1. *Define* (the term(s) ...) is intended literally, only a formal statement or equivalent paraphrase being required.
2. *What do you understand by/What is meant by* (the term(s) ...) normally implies that a definition should be given, together with some relevant comment on the significance or context of the term(s) concerned, especially where two or more terms are included in the question. The amount of supplementary comment intended should be interpreted in the light of the indicated mark value.
3. *State* implies a concise answer with little or no supporting argument (e.g. a numerical answer that can readily be obtained 'by inspection').
4. *List* requires a number of points, generally each of one word, with no elaboration. Where a given number of points is specified this should not be exceeded.
5. (a) *Explain* may imply reasoning or some reference to theory, depending on the context. It is another way of asking candidates to give reasons. The candidate needs to leave the examiner in no doubt why something happens.
(b) *Give a reason/Give reasons* is another way of asking candidates to explain why something happens.
6. *Describe* requires the candidate to state in words (using diagrams where appropriate) the main points. *Describe* and *explain* may be coupled, as may *state* and *explain*.
7. *Discuss* requires the candidate to give a critical account of the points involved.
8. *Outline* implies brevity (i.e. restricting the answer to giving essentials).
9. *Predict* implies that the candidate is expected to make a prediction not by recall but by making a logical connection between other pieces of information.
10. *Deduce* implies that the candidate is not expected to produce the required answer by recall but by making a logical connection between other pieces of information.
11. *Suggest* is used in two main contexts, i.e. either to imply that there is no unique answer (e.g. in physics there are several examples of energy resources from which electricity, or other useful forms of energy, may be obtained), or to imply that candidates are expected to apply their general knowledge of the subject to a 'novel' situation, one that may be formally 'not in the syllabus' – many data response and problem solving questions are of this type.
12. *Find* is a general term that may variously be interpreted as *calculate*, *measure*, *determine*, etc.
13. *Calculate* is used when a numerical answer is required. In general, working should be shown, especially where two or more steps are involved.
14. *Measure* implies that the quantity concerned can be directly obtained from a suitable measuring instrument (e.g. length using a rule, or mass using a balance).
15. *Determine* often implies that the quantity concerned cannot be measured directly but is obtained from a graph or by calculation.
16. *Estimate* implies a reasoned order of magnitude statement or calculation of the quantity concerned, making such simplifying assumptions as may be necessary about points of principle and about the values of quantities not otherwise included in the question.
17. *Sketch*, when applied to graph work, implies that the shape and/or position of the curve need only be qualitatively correct, but candidates should be aware that, depending on the context, some quantitative aspects may be looked for (e.g. passing through the origin, having an intercept).
In diagrams, *sketch* implies that simple, freehand drawing is acceptable; nevertheless, care should be taken over proportions and the clear exposition of important details.



Discussion

▶ 1.7.1 Energy resources

Describe how electricity or other useful forms of energy may be obtained from:

- ▶ – chemical energy stored in fuel
- ▶ – water, including the energy stored in waves, in tides, and in water behind hydroelectric dams
- ▶ – geothermal resources
- ▶ – nuclear fission
- ▶ – heat and light from the Sun (solar cells and panels)
- ▶ – wind

Give advantages and disadvantages of each method in terms of renewability, cost, reliability, scale and environmental impact

Identify changes in kinetic, gravitational potential, chemical, elastic (strain), nuclear and internal energy that have occurred as a result of an event or process

Recognize that energy is transferred during events and processes

Apply the principle of conservation of energy to simple examples

Discussion

▶ Mark scheme and *Examiner Report*

- ▶ 4(a) (gravitational) potential (energy)/(G)PE **1 mark**
- ▶ *Common incorrect responses: chemical energy ; renewable energy*

- ▶ 4(b) any **three** from:
 - ▶ water flows down **OR** water flows at constant speed
 - ▶ water drives turbine **OR** turbine rotates
 - ▶ turbine turns generator (at constant speed)
 - ▶ electricity generated/produced **Max. 3 marks**

- ▶ *Less able candidates simply described the diagram.*

- ▶ 4(c) transferred to thermal **OR** sound **1 mark**
 - ▶ dissipated to the surroundings **1 mark**

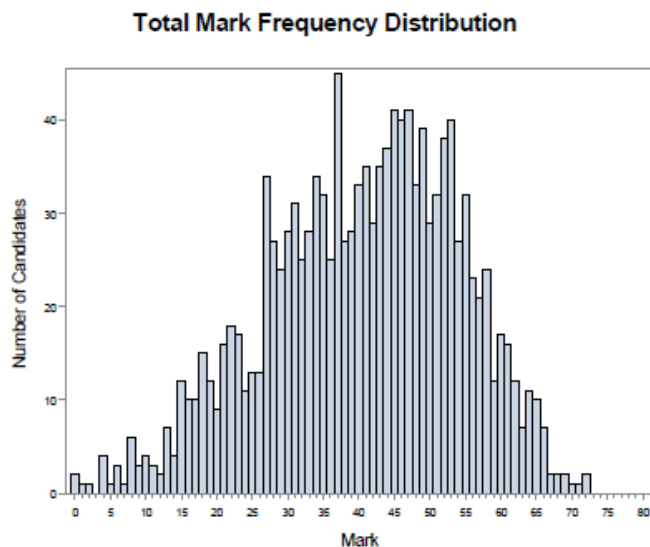
- ▶ *Common misunderstanding: energy evaporated*

- ▶ 4(d) shorter (travelling) distance/water in B higher than A/water from A has to be pumped (up to C) **1 mark**

Discussion

► Handout 6 – Q5 (0625/31, J18)

Item	Facility	Omit	Discrimination
5(a)	0.88	0.01	0.40
5(b)	0.27	0.03	0.29
5	0.63	0.01	0.45



5 Fig. 5.1 shows a geothermal power station. It generates electricity.

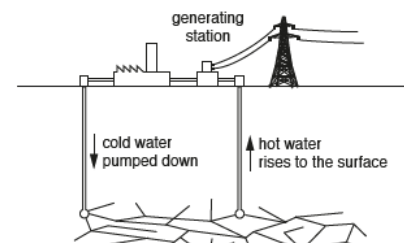


Fig. 5.1

(a) In a geothermal power station, the process of generating electricity includes seven stages. Four of the stages are shown below.

- P steam turns a turbine
- Q hot underground rocks heat the cold water
- R the turbine spins a generator
- S hot water rises to the surface

The flow chart in Fig. 5.2 shows the seven stages, but it is incomplete. Complete the flow chart by adding the letters P, Q, R and S in the correct sequence.

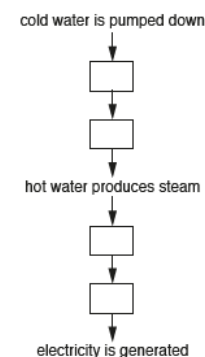


Fig. 5.2

[3]

Support for teachers

- ▶ **Cambridge Assessment International Education**
- ▶ <http://www.cambridgeinternational.org/>
- ▶ Endorsed textbooks

- ▶ **School Support Hub**
- ▶ <https://teachers.cie.org.uk/index.html>
- ▶ Syllabuses
- ▶ Question papers, mark schemes, Examiner reports, grade thresholds
- ▶ Schemes of work
- ▶ Example Candidate Responses (exemplifying common misunderstandings)
- ▶ Teacher guides
- ▶ Resource Plus
- ▶ Discussion forum

Thank you
Any questions?



Learn more!

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