

HIGHER VERB QUESTIONS

From syllabus dot points

Five 'ASSESS' questions and one 'DISCUSS' question

MODULE	SYLLABUS STATEMENT	DOT POINT
9.3 Motors and generators	3. Generators are needed to provide large scale power production.	Assess the effects of the development of AC generators on society and the environment.
	4. Transformers allow generated voltage to be either increased or decreased before it is used.	Discuss the impact of the development of transformers on society.
9.6 Medical physics	4. The magnetic field produced by nuclear particles can be used as a diagnostic tool.	Gather and analyse information and use available evidence to assess the impact of the medical applications of physics on society.
9.7 Astrophysics	4. Photometric measurements can be used for determining distance and comparing objects.	Identify data sources and gather, process and present information to assess the impact of improvements in measurement technologies on our understanding of celestial objects.
9.8 From quanta to quarks	2. The limitations of classical physics gave birth to quantum physics.	Gather, process, analyse and present information and use available evidence to assess the contributions made by Heisenberg and Pauli to the development of atomic theory.
	4. An understanding of the nucleus has led to large science projects and many applications.	Gather, process and analyse information to assess the significance of the Manhattan Project to society.

The verb scaffolds for 'assess' and 'discuss' have been used to construct a scaffold for answering questions sourced from the above dot points. Note, however, that examination questions can be drawn from multiple dot points and prescribed focus area material.

Sample scaffold for constructing a suitable answer

Motors and generators

Verb: 'Assess'**Definition:** Make a judgment of the value, quality, outcomes, results or size of a given development etc.**Question:** *Assess the effects of the development of AC generators on society and the environment.*

Introduction

Opening sentence—general statement outlining the issue in the question that is to be assessed: *AC generators have made cheap and reliable electricity available to the vast majority of the population.*

Identify the issue clearly: *Every household, except in remote areas, can use the electricity from AC generators, as can schools, hospitals and factories.*

Aspects to consider:

- environmental
- economic
- health/welfare
- science/technology
- cultural
- recreational

Body of response

Society:

- *better health as a result of improved diagnostic equipment and hospital care*
- *better communication: radio TV, internet*
- *increased safety (street lights, work areas)*
- *longer hours/shiftwork possible (not so good?)*
- *concentrated areas of work (cities, factories)*

Environment:

- *cleaner than burning wood*
- *large, efficient generators can be placed far from cities*
- *huge demand = large CO₂ emissions → increased greenhouse gases → global warming → climate change → rising sea levels, more storms/droughts etc.*

Overall:

We (our society) are possibly too dependent on AC generators for almost every aspect of our lives. However, in the long term, the benefits appear to outweigh the negatives only if solutions to the problem of global warming can be found.

Key terms:

for example
causing
allowed advances
improved

Conclusion

Summarise the overall impact/effect that the development has had, and *make an assessment* of its overall effect (e.g. insignificant, significant, large etc.): *Society has been changed and huge advances have been made in medicine, technology and communications. Some say family life has suffered, with longer work hours etc., but overall AC generators have changed our way of life forever.*

Concluding/summing up: *It is clear that AC generators have had a very significant effect on every aspect of our society. They affect us on a personal level and have changed the way our whole community lives.*

Key terms:

large
changed
significant
vast improvement

Sample scaffold for constructing a suitable answer

Motors and generators

Verb: 'Discuss'
Definition: To give points for and/or against
Question: *Discuss the impact of the development of transformers on society.*

Introduction

Opening sentence—clearly identify the issue in the question to be discussed: *e.g. Transformers are used to step-up and step-down voltage in AC circuits, they are widely used in many aspects of modern society.*

Body of response

Give points *for* the issue, i.e. in favour (e.g. benefits, positive outcomes, positive consequences):

- *improved efficiency in transmission of electricity over long distances*
- *allow power stations to be situated away from populated areas*
- *allow development of appliances which run at different voltages*

Give points *against* the issue, i.e. negative factors (e.g. expense, limited uses, negative consequences etc.):

- *not 100% efficient*
 - *can fail without notice which can be expensive to remedy*
- Note: This information could be put in table form.*

Key words:

positive
benefits
negative
expense
consequences

Conclusion

Summarise overall points for and against: *Although transformers are not 100% efficient, they are far superior to earlier (DC) technologies. Without transformers, society would not be able to rely as it does on cheap, readily available electricity.*

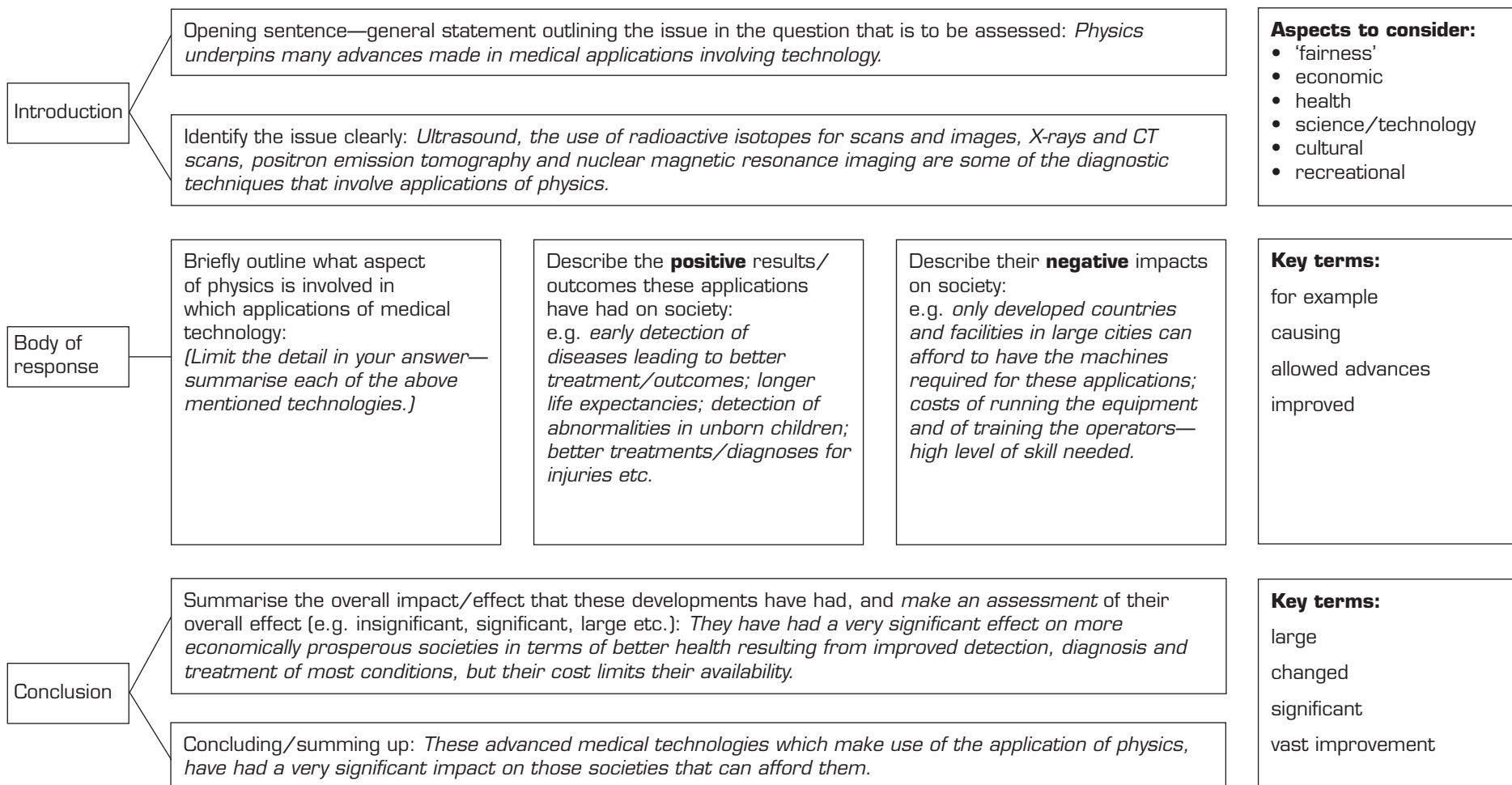
Concluding/summing up statement: *The development of transformers has had a major positive impact on our society.*

Key words:

overall
beneficial
not beneficial

Sample scaffold for constructing a suitable answer

Medical physics

Verb: 'Assess'**Definition:** Make a judgment of the value, quality, outcomes, results or size of a given development etc.**Question:** Gather and analyse information and use available evidence to **assess** the impact of the medical applications of physics on society.

Sample scaffold for constructing a suitable answer

Astrophysics

Verb: 'Assess'**Definition:** Make a judgment of the value, quality, outcomes, results or size of a given development etc.**Question:** Identify data sources and gather, process and present information to **assess** the impact of improvements in measurement technologies on our understanding of celestial objects.

Introduction

Opening sentence—general statement outlining the issue in the question that is to be assessed: *The digital era, with remote imaging and powerful and sensitive CCDs, has changed the way in which astronomers gather information about celestial objects.*

Identify the issue clearly: *These improved technologies have superseded photographic film and plates. The older techniques for recording the light from stars have only a fraction of their sensitivity and respond to a limited range of wavelengths. They also require a person to be present to operate them.*

Aspects to consider:

- environmental
- society's knowledge
- science
- unexpected applications
- recreational

Body of response

Give examples of applications: e.g. *Hubble, Chandra, Spitzer space-based observatories, ground-based telescopes using active optics and adaptive optics.*

Describe how the measurement technologies work: e.g. *CCDs are the 'retinas' of digital cameras—tiny photocells that detect light falling on them—or phototubes that amplify very small signals gathered by telescopes; how the optics systems work to improve resolution.*

What improvements in our understanding of celestial objects have resulted? *We have gained knowledge of objects such as the source of gamma ray bursts that we had no idea about previously; we have been able to record images of distant faint galaxies on the edge of the known universe.*

Key terms:

causing
allowed advances
improved

Conclusion

Summarise the overall impact/effect that these developments have had, and *make an assessment* of their overall effect (e.g. insignificant, significant, large etc.): *In many different ways these technologies have allowed better observations to be made—greater detail, greater range of wavelengths etc.*

Concluding/summing up: *Our understanding of celestial objects has increased enormously (and many more questions are being asked) as a result of the improvements in measurement technologies made in the past few decades. The impact of such technologies has been profound.*

Key terms:

large
changed
significant/profound
vast improvement

Sample scaffold for constructing a suitable answer

From quanta to quarks

Verb: 'Assess'**Definition:** Make a judgment of the value, quality, outcomes, results or size of a given development etc.**Question:** Gather, process, analyse and present information and use available evidence to **assess** the contributions made by Heisenberg and Pauli to the development of atomic theory.

Introduction

Opening sentence—general statement outlining the issue in the question that is to be assessed:
Quantum theory allowed scientists such as Heisenberg and Pauli to contribute further to the understanding of the structure of the atom, especially electron behavior and arrangement.

Identify the issue clearly: *Contributions made by both Heisenberg and Pauli explained why atoms behave in terms of their structure, chemical bonding and physical properties.*

Aspects to consider:

- environmental
- economic
- health/welfare
- science/technology
- cultural

Body of response

Heisenberg: *The behaviour of electrons (due to the uncertainty principle) means that electrons should be regarded as existing in clouds rather than as finite particles within atoms.*

Pauli: *The exclusion principle states that no two electrons in the same atom can share the same set of quantum numbers.*

Development of atomic theory:
The quantum theory atom becomes quite different from the old classical atom.

Key terms:

for example
 causing
 allowed advances
 improved

Conclusion

Summarise the overall impact/effect that the development has had, and *make an assessment* of its overall effect (e.g. insignificant, significant, large etc.): *Very significant changes were made to the view of the model of the atom due to the contributions of both scientists.*

Concluding/summing up: *Without Heisenberg and Pauli, the atomic theory at the time would have remained—explaining the atom using mostly classical physics. Their contribution allowed major significant advances to our view of the atom.*

Key terms:

large
 changed
 significant
 vast improvement

Sample scaffold for constructing a suitable answer

From quanta to quarks

Verb: 'Assess'**Definition:** Make a judgment of the value, quality, outcomes, results or size of a given development etc.**Question:** Gather, process and analyse information to **assess** the significance of the Manhattan Project to society.

Introduction

Opening sentence—general statement outlining the issue in the question that is to be assessed: *The Manhattan Project led directly to the development of nuclear weapons, which in turn led to the development of nuclear technologies to produce electricity in power stations and heat for energy to run submarines and space probes.*

Identify the issue clearly: *The Manhattan Project was initiated during World War II in the USA specifically to attempt to use the energy released when an uncontrolled fission chain reaction was made to occur as a weapon of war.*

Aspects to consider:

- environmental
- economic
- health/welfare
- science/technology
- cultural

Body of response

Describe the impact of the atom bomb on the ending of World War II:
e.g. *many civilian casualties, earlier end to the war.*

Positive outcomes:
e.g. *nuclear power and increased understanding of nuclear technology.*

Negative outcomes:
e.g. *nuclear weapons, nuclear radiation and fallout; arms race; accidents such as Chernobyl; long-term effects of radiation.*

Key terms:

for example
causing
allowed advances
improved

Conclusion

Summarise the overall impact/effect that the development has had, and *make an assessment* of its overall effect (e.g. insignificant, significant, large etc.): *The end to WWII, along with other significant positive effects, are balanced by the negative effects of the Manhattan Project. Taking all its effects into account, this Project has had a major impact on society.*

Concluding/summing up: *The Manhattan Project had very significant effects, both in the short term and the long term. Some say that without the war these developments would still have occurred, only at a later time, but the impact on society would have been the same either way.*

Key terms:

large
changed
significant
vast improvement