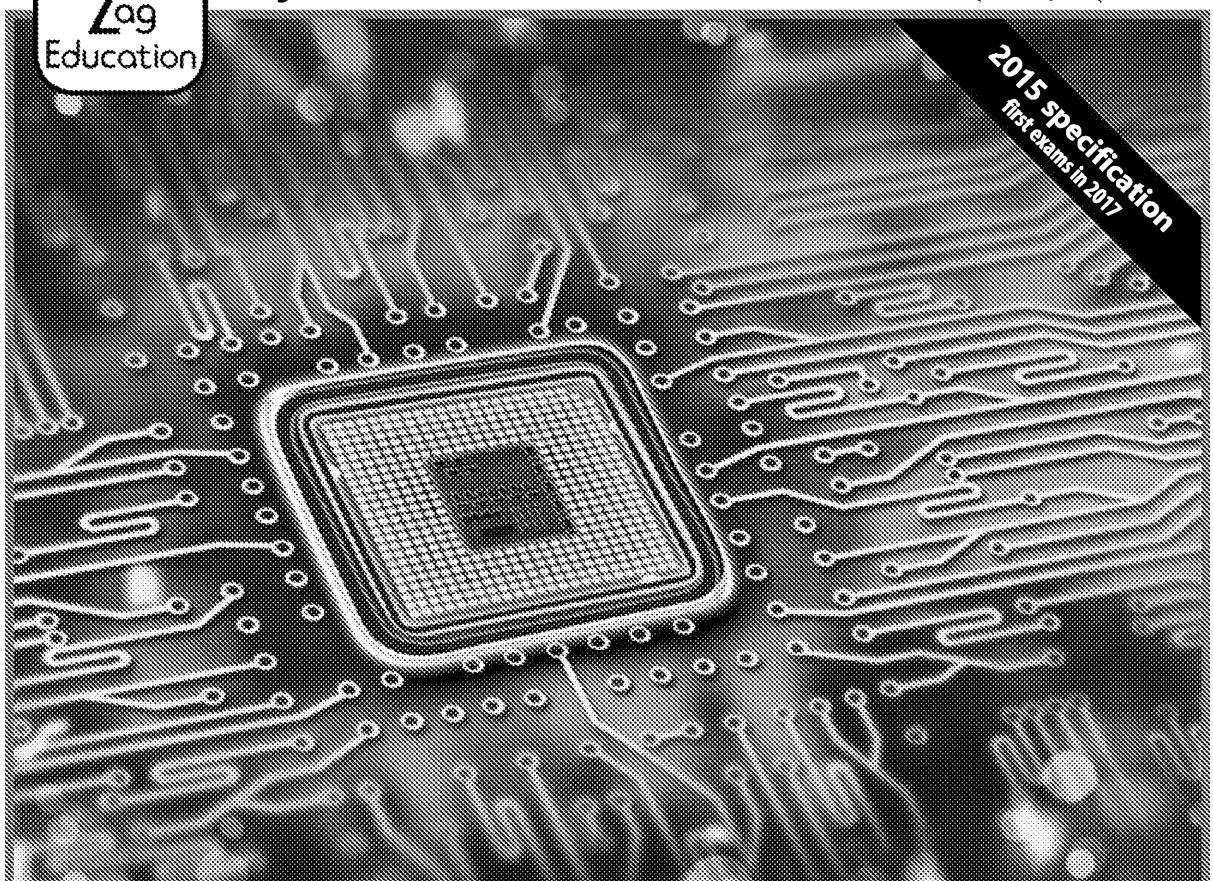
Zig Zag Education

Physics

A Level | AQA | 7408



Topic Tests for A Level AQA Physics

Option 13: Electronics

zigzageducation.co.uk

POD 6350

Contents

Teacher's Introduction

These topic tests have been designed to help you and your students assess their knowledge of a topic after you have taught each part of **A Level AQA Physics Option 13: Electronics** (specification for first teaching in September 2015).

Each topic test closely follows the content of the specification and includes:

- **Factual questions**: Some simpler factual questions are included to ensure that all the content and basics are covered, and to allow weaker learners access to some marks.
- **Short-answer questions**: These are not in exam style, and the purpose of these is to test different elements, knowledge and skills from the specification in a variety of styles.
- **Exam-style questions**: Where appropriate, topics may contain one or more exam-style questions, to prepare students for what they might meet in the exam, and to test exam skills.

Mathematical and practical skills are also covered in these topic tests.

Tests have been designed to take approximately 25–40 minutes and are worth between 29 and 38 marks. Please note that some tests have been combined, as shown in the table:

Topic Number	Number of Marks
3.13.1	36
3.13.2&3	33
3.13.4&5	38
3.13.6	29

The topic tests are suitable for a classroom assessment, revision aid or homework task and are, therefore, suitable for use immediately after a topic is completed in class or at the end of teaching the course.

Students are able to see the number of marks awarded for each question, allowing them to gauge the level of detail they will require for the answers, as in exam conditions. Full answers with marks are included at the end of the resource. Additionally, it makes the resource a suitable tool for students to use independently.

It is recommended that students have access to a calculator to complete the questions.

Students may also need a sheet containing Physics data and formulae, which can be found on the exam board website.

I hope you find these tests useful during your teaching.

A C Shaw, March 2015

3.13.2&3 Analogue and Digital Signals

1. a) What is a bit?

.....

.....

b) How does a computer measure the value of a bit?

.....

c) How many bits are in a byte?

.....

2. a) Wh[illegible]nd [illegible]is collected by microphones, ammeters and light me[illegible]

.....

b) What does 'sample rate' mean?

.....

.....

c) Give an advantage and a disadvantage of a low sample rate.

Advantage: .....

.....

Disadvantage: .....

.....

3. a) State two characteristics of an ideal operational amplifier.

i) .....

ii) .....

b) Describe how an ideal operational amplifier [illegible]e [illegible]sed as a comparat[illegible]

.....

.....

.....

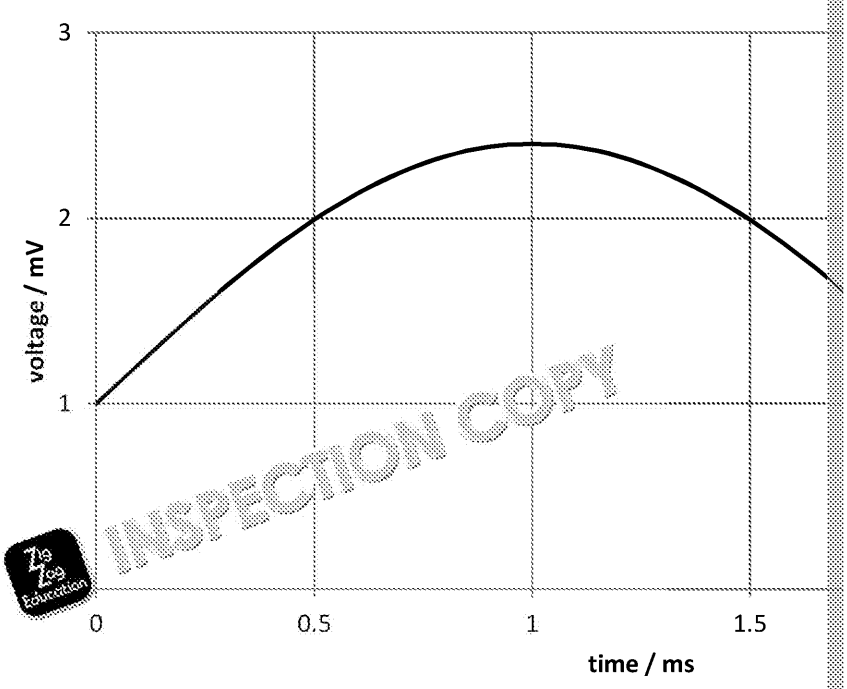
c) An ideal operational amplifier with an open loop gain of 100,000 has th[illegible] has 2 mV applied to the non-inverting input. What is the output voltage

.....

.....

.....

4. a) Convert this analogue signal into digital form. Sample every 0.5 ms and



.....

.....

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.....

.....

b) What advantage would there have been of using more bits per sample?

.....

.....

c) How is the signal broadcast over a radio channel?

.....

.....

d) When the data is transmitted some noise is added.

i) What form does the noise take?

.....

.....

ii) How is the original signal recovered?

.....

.....

.....

5. a) Radio receivers use resonance filters to select one channel in favour of
An LC resonance filter has a capacitance of 2.2 nF and an inductance of
frequency?

.....

.....

.....

.....

.....

b) What is the Q factor for this filter if its b nd idth is 5.0 MHz?

.....

.....

.....

c) Sketch the energy response curve for this filter. Mark on the resonant f

d) An LC resonance filter is often compared to a mass on a spring. What is

inductance? .....

capacitance? .....

3.13.2&3 Analogue and Digital Signals

1. a) What is a bit?

   b) How does a computer measure the value of a bit?

   c) How many bits are in a byte?

2. a) What kind of data is collected by microphones, ammeters and light me

   b) What does 'sample rate' mean?

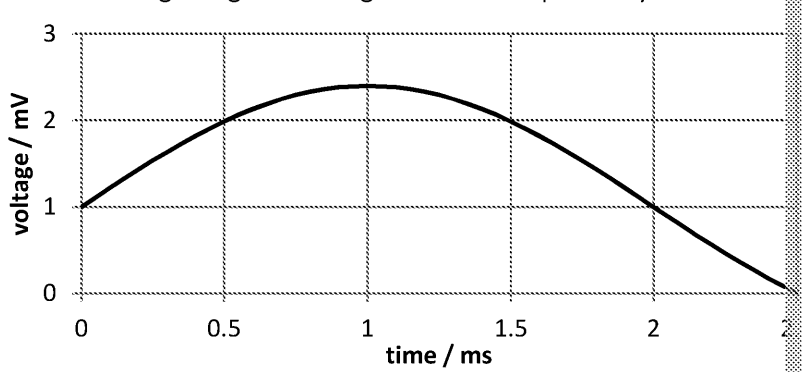
   c) Give an advantage and a disadvantage o[illegible] mple rate.

3. a) State two charact[illegible] an ideal operational amplifier.

   b) D[illegible] h[illegible] an ideal operational amplifier can be used as a comparat

   c) An ideal operational amplifier with an open loop gain of 100,000 has th
   It then has 2 mV applied to the non-inverting input.
   What is the output voltage, assuming it doesn't saturate?

4. a) Convert this analogue signal into digital form. Sample every 0.5 ms and



   b) What advantage would there have been of using more bits per sample?

   c) How is the signal broadcast over a radio channel?

   d) When the data is transmitted some noise is added.
      i) What form does the noise take?

      ii) How is the original signal recov[illegible]?

5. a) Radio receive[illegible] resonance filters to select one channel in favour of
   a [illegible]ta[illegible] 0.2 nF and an inductance of 1.5×10^{-9} H. What is its re

   b) Wh[illegible] the Q factor for this filter if its bandwidth is 5.0 MHz?

   c) Sketch the energy response curve for this filter. Mark on the resonant f

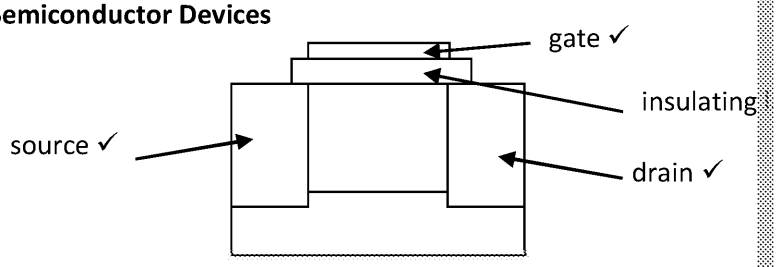
   d) An LC resonance filter is often compared to a mass on a spring. What is
      i) inductance?
      ii) capacitance?

Preview of Questions Ends Here

Answers

3.13.1 Discrete Semiconductor Devices

1. a)



b) source: supplies electrons ✓
sink: absorbs electrons ✓
gate: controls flow ✓

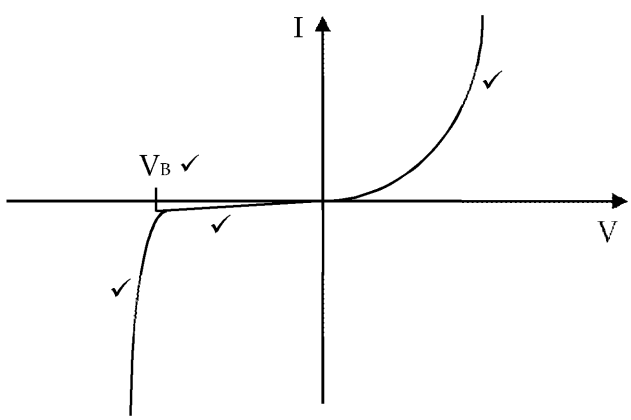
c) 0

d) $V_{GS} > V_{th}$

e) electrons to create the inversion layer

f) switch

2. a)



b) 1 mA

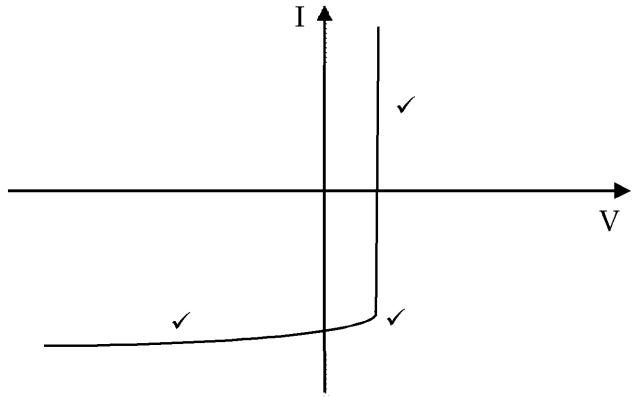
c)

d) i) constant/reference voltage supply

ii) stop diode burning out / being damaged / being overloaded

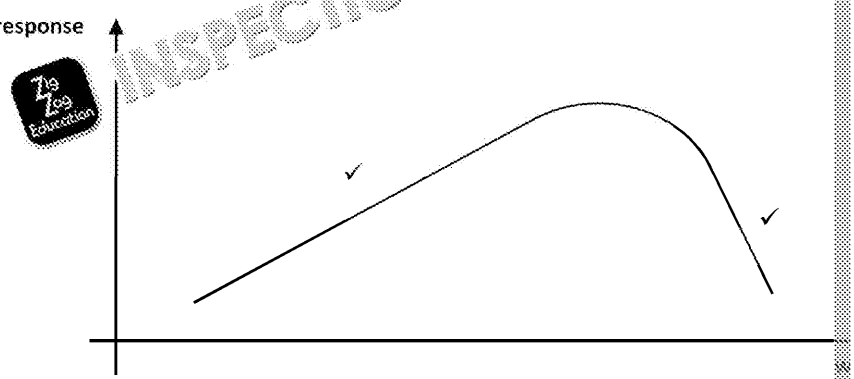
e) (–)17 (V)

3. a)



b) increases (magnitude) / becomes more negative

c)



d) linear/proportional

e) scintillation screen/layer ✓
flashes when hit (by alpha particle) ✓
flashes detected by photodiode ✓

4. a) senses Earth's magnetic field ✓
Changes in angle means changes in the direction of the field relative to the sensor ✓

b) put magnet on wheel/axle ✓
each time magnet passes the sensor it is detected / makes peak in response ✓
number of revolutions per second (and wheel circumference) allow speed to be calcula

Preview of Answers Ends Here