

## Amateur Radio Examination Intermediate Level [E48159I]

Candidate: INTERMEDIATE, Mock (Mr) [N144839]

Date of Birth: 01 Jan 1950

Exam Centre: RSGB (RSGB TEST)

Date: Mon, 01 Nov 2021 09:00 GMT

This paper consists of 46 questions. **Time allowed:** 90 minutes

Candidate Declaration <i>I confirm that this is all my own work and that I have followed the rules of the examination.</i>	Candidate's Signature
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### INSTRUCTIONS TO CANDIDATES

You should have 3 items.

1. This Examination Paper
2. An Optical Mark Sheet
3. Reference Data for use in the Intermediate Level Examination

You will need a pen to sign this form and complete the Optical Mark Sheet, an HB Pencil and an eraser. You may use a silent, non-programmable calculator.

All questions have equal marks and all questions should be attempted.

Your answers should initially be marked in pencil on the Optical Mark Sheet or the examination paper itself. Errors should be corrected using your eraser. When you are satisfied that your answers are final, you should **INK IN** the answer box on the Optical Mark Sheet using a black pen.

Each question has 4 possible answers, identified 'A', 'B', 'C' and 'D'. Only one answer is correct, the others are wrong. You should decide which of the 4 answers is correct and mark the answer box for each question accordingly.

If you decide answer 'C' is correct, show this by shading in the box marked 'C' <b>using an HB pencil.</b>	A <input type="checkbox"/> B <input type="checkbox"/> C <input checked="" type="checkbox"/> D <input type="checkbox"/>
If you change your mind before inking-in, rub out the shading and shade in the box for your new choice.	A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>

When you are satisfied with your answer, shade in the whole box with **black ink**. Do **NOT** make any mark outside the box. **Once you have inked-in the Optical Mark Sheet, no changes can be made.**

The Reference Data booklet contains the Schedule to the Licence which may be used to help answer any question.

**The Optical Mark Sheet is designed to be machine marked and will provide your result for this Examination.**

**It must be completed during the time allowed for the Examination.**

**This paper, the Optical Mark Sheet and Reference Data Booklet must be handed in at the end of the Examination.**

## **NOTICE TO CANDIDATES**

You must not talk to or distract any other candidate in the exam room.

You are not allowed any assistance with the exam questions and the Invigilator is not permitted to discuss examination questions.

If you need other assistance, please raise your hand and talk quietly to an Invigilator when approached.

You may not leave the exam room without permission and may not re-enter the room unless you have been escorted by an Invigilator at all times.

You must only use black ink for your final answers on the Optical Mark Sheet, and any calculations may be done on the reverse of the Examination Paper.

Exam Papers and Optical Mark Sheets are **candidate specific**.

Please ensure this question paper and your OMR sheet has **your** name printed at the top, as incorrectly issued documents could deem the Examination **VOID**.

- 1.** You are visiting your friend who is a Full licence holder and using his transmitter at 200 watts. Your friend leaves the room. You may continue operating
- 1B2.5260.1  
N144839
- A.** at 200 Watts because your friend is supervising you using a hand-held
  - B.** at 200 Watts because your friend is still on the premises
  - C.** at the same power but must use your own callsign
  - D.** but must use your own callsign and licence conditions.
- 2.** You answer a CQ call which is calling for a contact in your home town. You are then asked to pass on a message to a person who may not be an amateur. You may
- 1C1.7832.2  
N144839
- A.** not pass the message under any circumstances
  - B.** pass the message if it relates to an international disaster
  - C.** pass the message if the originator or recipient is an amateur
  - D.** pass the message if the originator is an amateur.
- 3.** If an amateur radio station is causing any undue interference to other wireless telegraphy, the emissions shall be suppressed or reduced, to the satisfaction of
- 1D1.5274.1  
N144839
- A.** Licensee
  - B.** Ofcom
  - C.** Radio Society of Great Britain
  - D.** Radio Licensing Centre.
- 4.** What special terms, if any, apply to the unattended operation of a beacon for a direction finding competition?
- 1E1.7414.4  
N144839
- A.** The beacon must not give a recognised amateur callsign if unattended at the time
  - B.** Unattended operation is limited to periods of 30 minutes
  - C.** The power is limited to a maximum of 500mW pep e.r.p.
  - D.** There are no special terms; simply comply with the normal licence conditions.

- 5.** The UK Intermediate amateur radio licence only permits operation in
- 1F1.7417.2  
N144839
- A.** the United Kingdom of Great Britain and Northern Ireland, the Channel Islands and the Isle of Man
  - B.** those countries that have agreed to the CEPT common European amateur radio licence
  - C.** those countries which are covered by the Radio Regulations of the International Telecommunication Union
  - D.** the UK and Commonwealth countries which recognise the monarch as their sovereign.
- 6.** The maximum power permitted on a frequency of 1.900MHz is
- 1G1.5311.1  
N144839
- A.** 1W
  - B.** 40W
  - C.** 50W
  - D.** 32W.
- 7.** Three resistors are connected in series,  $R_1=100\Omega$ ,  $R_2=1.5k\Omega$   $R_3=10k\Omega$ . What is the total resistance of the series circuit?
- 2C1.5365.1  
N144839
- A.** 11.6k $\Omega$
  - B.** 111.5k $\Omega$
  - C.** 111.5 $\Omega$
  - D.** 10k $\Omega$ .
- 8.** Batteries have a physical property known as their 'internal resistance'. One effect of this is to
- 2C3.5411.1  
N144839
- A.** increase the EMF of the battery in proportion to the current drawn
  - B.** act as an independent parallel resistance to the load on the battery
  - C.** increase the potential difference at the battery terminals as more current is drawn
  - D.** reduce the potential difference at the battery terminals as more current is drawn.

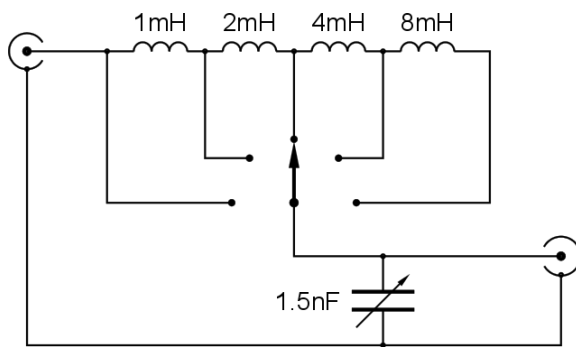
**9.** A device with two conducting plates separated by an insulating material is called

2D1.5421.1  
N144839

- A. a capacitor
- B. an inductor
- C. a rectifier
- D. a diode.

**10.** In the switched inductance unit shown the switch selects how many coils are used. In the position shown the total inductance used is about

2D6.5463.1  
N144839



- A. 2mH
- B. 15mH
- C. 3mH
- D. 1.5mH.

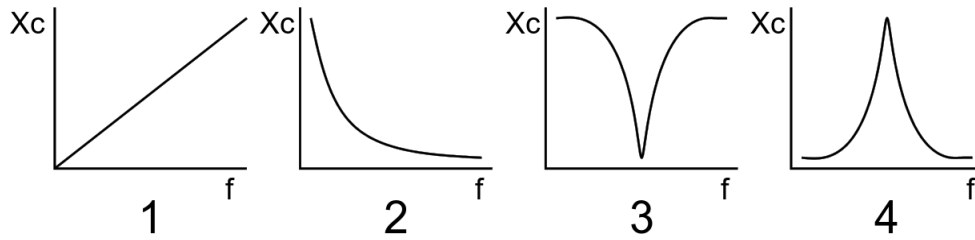
**11.** A sinewave with a Peak-to-Peak value of 22V will have an RMS value of approximately

2E3.5487.1  
N144839

- A. 31V
- B. 44V
- C. 8V
- D. 16V.

**12.** Which graph shows the change in reactance of a capacitor as the frequency increases?

2E4.7431.5  
N144839



- A. Graph 1
- B. Graph 3
- C. Graph 2
- D. Graph 4.

**13.** A long perfectly matched open wire feeder is carrying a signal of wavelength 10m. At a particular instant in time the voltage at a point on the feeder is +10V. How much further along the feeder will the voltage be -10V at the same instant in time?

2E8.7385.2  
N144839

- A. 10m
- B. At the transmitter
- C. Nowhere
- D. 5m.

**14.** What is the effect of using too few bits to represent each sample of an analogue signal?

2F1.7440.2  
N144839

- A. The higher audio frequencies in the signal will be incorrectly captured
- B. The subsequent processing of the original signal will fail rendering it totally useless
- C. The digital signal will introduce distortion in the representation of the signal
- D. Some of the frequencies present in the signal will be incorrectly recorded.

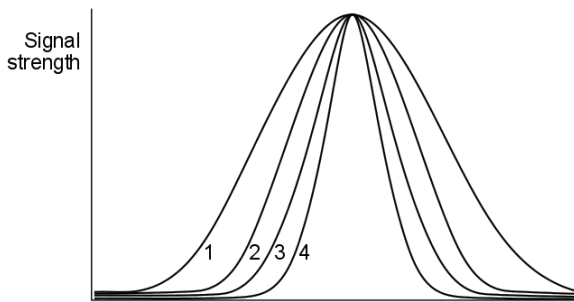
**15.** Increasing the number of turns on the secondary winding of a transformer will

2G1.5548.1  
N144839

- A. increase the current output of the transformer
- B. increase the power output of the transformer
- C. have no effect on the transformer's output
- D. increase the voltage output of the transformer.

**16.** Which tuned circuit has the greatest selectivity.

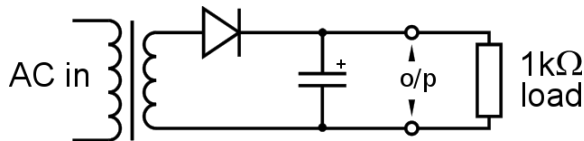
2H4.5578.4  
N144839



- A. 4
- B. 1
- C. 3
- D. 2.

**17.** The purpose of the diode in the circuit diagram below is to

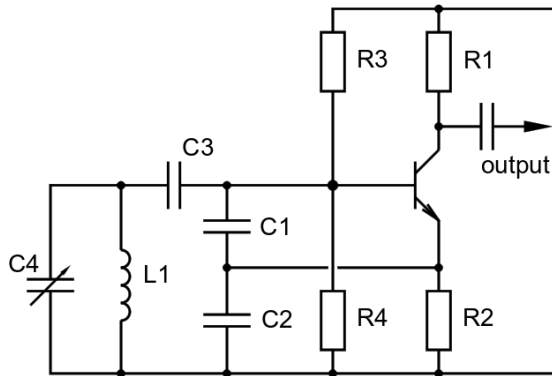
2I1.5600.1  
N144839



- A. allow current to flow only in one direction
- B. limit the current flowing to a safe level
- C. store a charge between successive half cycles
- D. change the AC supply voltage to a lower value.

**18.** What components are most important in determining the output frequency from this circuit?

2I5.7454.7  
N144839



- A. The feedback signal set by R2
- B. The ratio of C1 and C2
- C. C1, C2 and C3
- D. L1 and C4.

**19.** In a mains power supply unit the purpose of the reservoir capacitor is to

2J3.5647.1  
N144839

- A. smooth the DC pulses
- B. reduce the 230V AC to 12V AC
- C. reduce the mains 230V AC to 12V DC
- D. change the AC to pulses of DC.

**20.** A key advantage of an integrated circuit is that it

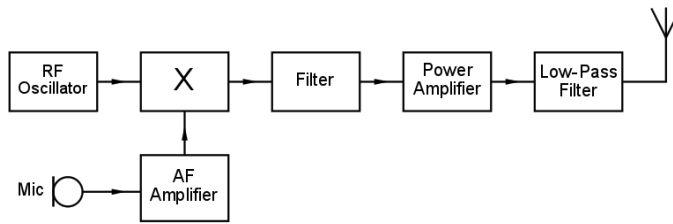
2I6.7457.4  
N144839

- A. minimises the risk of RF interference from one circuit to the next
- B. allows each of the different functions to be repaired separately
- C. enables complete functions to be carried out using a single device
- D. reduces the effect of temperature variations in higher powered devices.



**21.** The diagram shows a block diagram of an AM transmitter. What is the block marked X?

3B1.5669.1  
N144839



- A. Modulator
- B. Buffer amplifier
- C. Sideband filter
- D. IF amplifier.

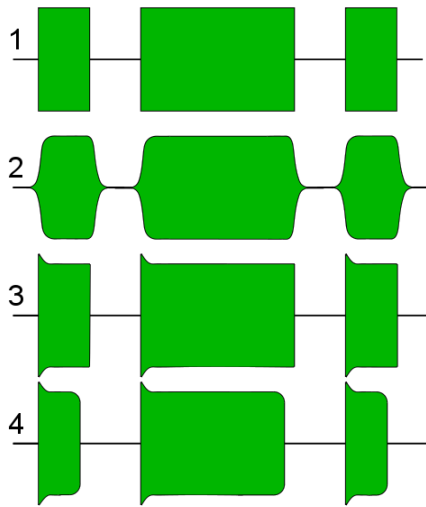
**22.** The RF output power of a transmitter is always

3F1.5717.1  
N144839

- A. unaffected by the DC input power
- B. the same as the DC input power
- C. greater than the DC input power
- D. less than the DC input power.

**23.** The drawings show the transmitted waveform of a CW transmitter sending the letter R. Which waveform will result in the minimum transmitted bandwidth?

3G4.5773.1  
N144839



- A. waveform 2
- B. waveform 3
- C. waveform 4
- D. waveform 1.

**24.** Which ONE of the following will NOT affect the strength of an HF signal shown on the S meter?

3H2.5804.1  
N144839

- A. the time of year
- B. the AF gain control setting on the receiver
- C. the size of the antenna
- D. the polarisation of the antenna.

**25.** The local oscillator frequency

3I2.5819.1  
N144839

- A. is twice the intermediate frequency
- B. is always fixed at a set value chosen by the designer of the radio
- C. is half the intermediate frequency
- D. differs from the wanted frequency by the value of the intermediate frequency.

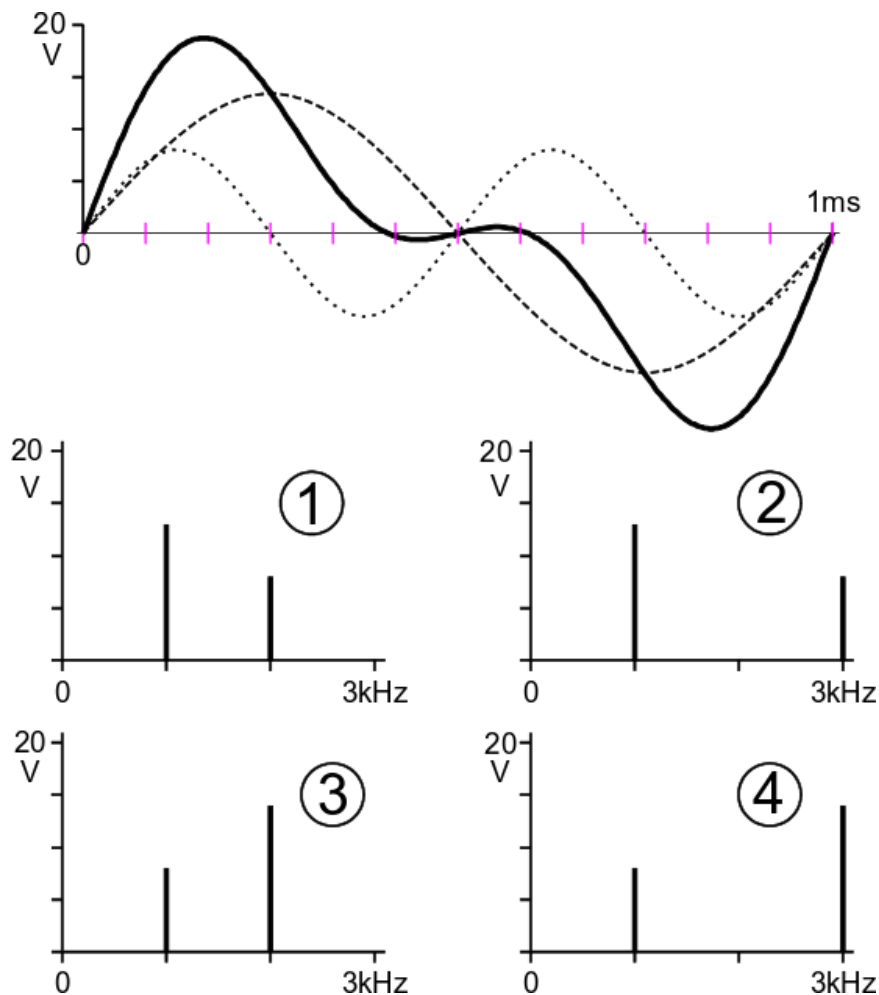
**26.** The volume from the loudspeaker of a radio receiver remains fairly constant even when the receiver is tuned between strong and weak signal. This is achieved by the

3L1.5874.1  
N144839

- A. automatic frequency control (AFC)
- B. automatic level control (ALC)
- C. automatic gain control (AGC)
- D. signal level control (SLC).

**27.** A sine wave and a harmonic are shown at the top of the drawing. Below are four representations in the frequency domain. Which one corresponds to the waveform shown?

3M2.7569.6  
N144839



- A. Graph 1
- B. Graph 4
- C. Graph 2
- D. Graph 3.

**28.** A number of ferrite rings threaded over a length of coaxial cable could act as a

4B1.5909.1  
N144839

- A. impedance changer
- B.  $\lambda/4$  transformer
- C. harmonic filter
- D. balun.

**29.** A horizontal HF dipole antenna is mounted quite close to the ground. A key effect of this will be to

4C4.5916.1  
N144839

- A. decrease the angle of radiation
- B. increase the angle of radiation
- C. increase the losses in the feeder
- D. decrease the losses in the feeder.

**30.** The capacitor in the trap of a trapped dipole antenna has become disconnected. What effect, if any, will this have?

4D2.5930.1  
N144839

- A. Difficulty will be experienced in achieving a match on the lower of the two designed frequencies
- B. Difficulty will be experienced in achieving a match on both of the designed frequencies
- C. Difficulty will be experienced in achieving a match on the higher of the two designed frequencies
- D. No effect will be readily apparent.

**31.** An Antenna Tuning (or Matching) Unit can be used between the transmitter and feeder to allow

4F1.5946.1  
N144839

- A. the antenna to act as if it were balanced, even if it is fed with coaxial cable without a balun
- B. the losses on the feeder system to be minimised, by cancelling out the feeder reactance
- C. the standing wave ratio on the feeder to be optimised, which will reduce the power lost from reflections
- D. a suitable load to be presented to the transmitter, so that one antenna can be used on several bands.

- 32.** The skip zone is the area
- 5A2.5984.1  
N144839
- A.** beyond the skywave
  - B.** beyond the skywave but still within ground wave coverage
  - C.** beyond the ground wave and before the earliest point of return of the skywave
  - D.** from the transmitter to the limit of ground wave coverage.
- 33.** What happens to the F1 and F2 layers at night?
- 5B3.6018.1  
N144839
- A.** They disappear
  - B.** They combine into a single layer
  - C.** They move nearer the magnetic poles
  - D.** They decrease in height.
- 34.** During daylight hours, an amateur band at a lower frequency such as 3.5MHz
- 5B4.6030.1  
N144839
- A.** can sometimes support long-distance contacts by means of “sporadic-E” propagation
  - B.** is likely to be good for long-distance propagation regardless of the MUF
  - C.** is only suitable for ionospheric propagation if the MUF is high enough
  - D.** is unlikely to allow long-distance propagation, because of D-layer absorption.
- 35.** An amateur transmitter can cause stronger RF fields than electronic equipment can tolerate. If interference occurs it may be necessary to
- 6A3.6059.1  
N144839
- A.** limit the transmitter power to below the maximum value specified in the licence
  - B.** check modulator stage in the transmitter
  - C.** fit harmonic filters to the transmitter
  - D.** confirm the transmitter is operating inside the amateur frequency bands.

- 36.** An elderly relative in a care home enjoys using headphones to listen to her small medium wave radio. It is occasionally interrupted by a rasping buzzing noise which is most frequent at the beginning and end of visiting times. A likely cause is
- 6B2.6089.1  
N144839
- A.** more frequent use of the tea making facilities for visitors
  - B.** overloading of the local phone cell site due to the number of users
  - C.** electronic games devices belonging to the younger visitors
  - D.** faulty suppression components in the lift motor control system.
- 37.** Signals from an HF transmitter can often be prevented from causing television interference by fitting a
- 6D1.6107.1  
N144839
- A.** low-pass filter to the external TV aerial
  - B.** high-pass filter at the transmitter
  - C.** low-pass filter at the TV aerial socket
  - D.** high-pass filter at the TV aerial socket.
- 38.** Which ONE of the following would provide a good earth for a transmitter?
- 6E2.6134.1  
N144839
- A.** A radiator or water pipe
  - B.** The neutral connection on a 13A plug
  - C.** A copper rod in the ground outside
  - D.** The earth connection on a 13A plug.
- 39.** A radio amateur having a PSK31 contact on 14.075MHz wishes to change to SSB on the same band. To comply with the International Amateur Radio Union band plan, the amateur should
- 7B1.6174.1  
N144839
- A.** move to a higher frequency such as 14.182MHz
  - B.** move to the SSB calling frequency on 14.099MHz
  - C.** move to a lower frequency such as 14.042MHz
  - D.** stay on the same frequency, which can also be used for SSB.

**40.** Which type of modulation of an amateur transmission would NOT normally be produced using a computer and a suitable interface?

7F2.6222.1  
N144839

- A. Slow scan television
- B. CW
- C. PSK31
- D. Single sideband.

**41.** A gas discharge arrestor is used to

8E1.6316.1  
N144839

- A. prevent surges in the mains supply
- B. prevent static interference to reception
- C. protect against excessive static charges
- D. prevent a lightning strike.

**42.** A mains powered piece of radio equipment has a maximum input rating of 800W at 230V. Which of the following would be the most appropriate rating for the fuse to be fitted in the mains plug?

8A4.6267.1  
N144839

- A. 13A
- B. 7A
- C. 3A
- D. 5A.

**43.** To help prevent cuts to yourself when using knives and files you should

8B2.6281.1  
N144839

- A. Keep your hands away from the 'sharp end'
- B. Store them in a tool box
- C. Clean them after use
- D. Keep them sharp.

**44.** A digital meter

9A3.6349.1  
N144839

- A. is operated from a keyboard
- B. moves a pointer over a scale
- C. contains a digital computer
- D. displays the reading as numbers.

**45.** An antenna is fed from a 50 Watt transmitter through feeder with negligible feeder loss. The antenna has a gain of 9dB. What is the effective radiated power?

9B1.6373.1

N144839

- A.** 450W
- B.** 400W
- C.** 100W
- D.** 59W.

**46.** To solder a wire to a small metal tag the soldering iron must heat the

9E1.7628.2

N144839

- A.** solder and wire only
- B.** tag and wire only
- C.** solder only
- D.** solder, wire and tag.