Electrical reasoning: applied practice: open practice pack

20 untimed questions across 4 authored sections.

Detail	Value
Pack	applied-practice-electrical-reasoning
Source	applied-practice
Pack version	v1
Worksheet items	20
Authored hints	0
Worked explanations	20

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Learner worksheet

Each item describes a circuit or an electrical situation in words. You need Ohm's law, the power relationship, and the difference between series and parallel connection. All of which the lesson works through. Nothing here is timed, and nothing here qualifies anyone to work on live equipment.

Choose one answer for each item. On a judgement item, more than one option is often defensible. Pick the one you would rate most effective, then check the worked explanation for why the runner-up is weaker.

Current, voltage, and resistance

Warm up on the three quantities every other item depends on, and on what each instrument actually measures.

1. electrical-reasoning-applied-s01-q01

A 12 V supply is connected across a single 4 ohm resistor. What current flows in the circuit?

- A. 0.33 A
- B. 3 A
- C. 48 A
- D. 8 A

Your answer: _____

2. electrical-reasoning-applied-s01-q02

How is a voltmeter connected, and what does it read?

- A. In series with the component, reading the current through it
- B. In series with the component, reading the voltage across it

- C. In parallel across the component, reading the potential difference across it
- D. In parallel across the component, reading the current through it

Your answer: _____

3. electrical-reasoning-applied-s01-q03

A heater on a 230 V supply draws 10 A. What power does it dissipate?

- A. 2300 W
- B. 23 W
- C. 240 W
- D. 2.3 W

Your answer: _____

4. electrical-reasoning-applied-s01-q04

The resistance of a circuit is doubled while the supply voltage is held constant. What happens to the current?

- A. It doubles
- B. It is unchanged
- C. It quadruples
- D. It halves

Your answer: _____

5. electrical-reasoning-applied-s01-q05

A cable is replaced by one of the same material and the same length but twice the cross-sectional area. What happens to its resistance?

- A. It doubles
- B. It is unchanged
- C. It halves
- D. It quadruples

Your answer: _____

Series and parallel circuits

Combine resistances and predict what happens when one branch changes. Most circuit-reading mistakes come from applying a series rule to a parallel branch.

6. electrical-reasoning-applied-s02-q01

Three 6 ohm resistors are connected in series. What is the total resistance?

- A. 2 ohm
- B. 6 ohm
- C. 12 ohm
- D. 18 ohm

Your answer: _____

7. electrical-reasoning-applied-s02-q02

Two 6 ohm resistors are connected in parallel. What is the total resistance?

- A. 3 ohm
- B. 6 ohm
- C. 12 ohm
- D. 1.5 ohm

Your answer: _____

8. electrical-reasoning-applied-s02-q03

Several components are wired in series across a battery. Which statement describes the circuit correctly?

- A. The current divides between the components in proportion to their resistance
- B. The current is the same at every point, and the supply voltage divides across the components
- C. The current is greatest in the component nearest the battery
- D. The current is the same everywhere, and so is the voltage across each component

Your answer: _____

9. electrical-reasoning-applied-s02-q04

In a string of decorative lamps, one lamp fails and every lamp in the string goes out. What does that tell you about the wiring?

- A. The lamps are in parallel
- B. The lamps are in parallel behind a shared switch
- C. The lamps are in series, so a break anywhere opens the only path
- D. The supply fuse is undersized

Your answer: _____

10. electrical-reasoning-applied-s02-q05

Two identical lamps are connected in parallel across a 12 V supply. One lamp is unscrewed and removed. What happens to the other?

- A. It stays at the same brightness, because it still has the full 12 V across it
- B. It becomes noticeably brighter
- C. It goes out
- D. It dims to about half brightness

Your answer: _____

Components and circuit reading

Identify what a component is for from what it does. These are the parts that appear on almost every schematic you will be asked to interpret.

11. electrical-reasoning-applied-s03-q01

Which component is designed to interrupt a circuit by melting when the current exceeds its rating?

- A. A capacitor
- B. A diode

- C. A fuse
- D. A transformer

Your answer: _____

12. electrical-reasoning-applied-s03-q02

What does a diode do in a circuit?

- A. It stores charge and releases it later
- B. It allows current to flow in one direction only
- C. It steps an alternating voltage up or down
- D. It converts current into heat at a fixed rate

Your answer: _____

13. electrical-reasoning-applied-s03-q03

A stairway light must be switchable from both the bottom and the top of the stairs. What arrangement does that?

- A. One single-pole single-throw switch at each end
- B. A relay at the light with a single switch
- C. A push-to-make button at each end
- D. A pair of two-way (single-pole double-throw) switches

Your answer: _____

14. electrical-reasoning-applied-s03-q04

A transformer has a primary-to-secondary turns ratio of 20:1 and its primary is fed from 240 V AC. What is the secondary voltage?

- A. 12 V
- B. 480 V
- C. 4800 V
- D. 20 V

Your answer: _____

15. electrical-reasoning-applied-s03-q05

A capacitor is connected across a steady DC supply through a resistor. What happens once it has fully charged?

- A. It passes direct current steadily from then on
- B. It behaves as a resistor of fixed value
- C. It reverses the polarity of the supply
- D. It blocks steady direct current, so the current in that branch falls to zero

Your answer: _____

Fault-finding and electrical safety

Reason from a symptom to a likely cause, and from a hazard to the control that removes it. Follow your local wiring rules and competence requirements in real work.

16. electrical-reasoning-applied-s04-q01

A circuit breaker trips the instant one particular appliance is switched on, every single time. What does that pattern most suggest?

- A. A short circuit inside the appliance drawing a very large current immediately
- B. A slightly loose lamp in a different room
- C. Too many lights left on elsewhere in the building
- D. A capacitor that has discharged over time

Your answer: _____

17. electrical-reasoning-applied-s04-q02

What condition is a residual current device (RCD) designed to detect?

- A. Sustained overload on the circuit
- B. A lightning surge on the incoming supply
- C. A supply voltage that has fallen below its nominal value
- D. A difference between the current in the line and neutral conductors, meaning current is leaking to earth

Your answer: _____

18. electrical-reasoning-applied-s04-q03

What is the correct first step before working on a fixed electrical circuit?

- A. Put on insulating gloves and work carefully on the live circuit
- B. Switch the appliance off at its own switch
- C. Isolate at the supply, lock off the isolator, and prove the circuit dead with a tester that is itself proved before and after
- D. Turn off the nearest lighting switch

Your answer: _____

19. electrical-reasoning-applied-s04-q04

A work lamp is noticeably dim when run from a long, thin extension reel, but normal when plugged into a nearby socket. What is the most likely cause?

- A. The lamp is rated for a higher wattage than the socket supplies
- B. Voltage drop along the long, thin cable
- C. The plug fuse is rated too high
- D. The extension reel uses a two-way switch

Your answer: _____

20. electrical-reasoning-applied-s04-q05

A conductor inside a flexible lead is suspected of being broken. The lead is disconnected and tested end to end with a continuity tester. What reading indicates an intact conductor?

- A. A high resistance reading
- B. A reading close to zero ohms; a broken conductor reads as an open circuit
- C. A reading equal to the supply voltage
- D. No reading at all until the supply is restored

Your answer: _____

Authored hints

This applied practice source does not publish separate authored hints: the rationale is attached to each item as a worked explanation instead. Every item is therefore listed as missing a hint, and no hint text is generated or inferred.

20 worksheet items do not have an authored hint. No hint text was generated for them.

Answer key

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Electrical reasoning: applied practice: open practice pack answer key

Item	Choice	Answer
electrical-reasoning-applied-s01-q01	B	3 A
electrical-reasoning-applied-s01-q02	C	In parallel across the component, reading the potential difference across it
electrical-reasoning-applied-s01-q03	A	2300 W
electrical-reasoning-applied-s01-q04	D	It halves
electrical-reasoning-applied-s01-q05	C	It halves
electrical-reasoning-applied-s02-q01	D	18 ohm
electrical-reasoning-applied-s02-q02	A	3 ohm
electrical-reasoning-applied-s02-q03	B	The current is the same at every point, and the supply voltage divides across the components
electrical-reasoning-applied-s02-q04	C	The lamps are in series, so a break anywhere opens the only path
electrical-reasoning-applied-s02-q05	A	It stays at the same brightness, because it still has the full 12 V across it
electrical-reasoning-applied-s03-q01	C	A fuse
electrical-reasoning-applied-s03-q02	B	It allows current to flow in one direction only
electrical-reasoning-applied-s03-q03	D	A pair of two-way (single-pole double-throw) switches
electrical-reasoning-applied-s03-q04	A	12 V
electrical-reasoning-applied-s03-q05	D	It blocks steady direct current, so the current in that branch falls to zero
electrical-reasoning-applied-s04-q01	A	A short circuit inside the appliance drawing a very large current immediately
electrical-reasoning-applied-s04-q02	D	A difference between the current in the line and neutral conductors, meaning current is leaking to earth
electrical-reasoning-applied-s04-q03	C	Isolate at the supply, lock off the isolator, and prove the circuit dead with a tester that is itself proved before and after
electrical-reasoning-applied-s04-q04	B	Voltage drop along the long, thin cable

electrical-reasoning-applied-s04-q05	B	A reading close to zero ohms; a broken conductor reads as an open circuit

Worked explanations

electrical-reasoning-applied-s01-q01: Ohm's law rearranges to current = voltage / resistance, so 12 / 4 = 3 A. The 0.33 A answer divides the other way round, and 48 A multiplies instead of dividing, a useful sanity check is that a bigger resistance must give a smaller current.

electrical-reasoning-applied-s01-q02: Voltage is a difference between two points, so the meter must bridge those two points, in parallel, and it has a very high resistance so that bridging them changes almost nothing. Putting a voltmeter in series is the classic error: its high resistance would nearly stop the circuit working.

electrical-reasoning-applied-s01-q03: Power is voltage multiplied by current: 230 x 10 = 2300 W. The 240 W answer adds the two figures instead of multiplying them, which happens to look plausible next to a familiar mains number.

electrical-reasoning-applied-s01-q04: At a fixed voltage, current is inversely proportional to resistance, so twice the resistance gives half the current. 'Unchanged' would be right only if the supply were a constant-current source rather than a constant-voltage one.

electrical-reasoning-applied-s01-q05: Resistance rises with length and falls with cross-sectional area, so doubling the area halves the resistance, which is why a longer run is specified in thicker cable. Doubling would be the answer for twice the length, not twice the area.

electrical-reasoning-applied-s02-q01: Series resistances add: 6 + 6 + 6 = 18 ohm. The 2 ohm answer is the parallel result for the same three resistors, which is the combination this is most often confused with.

electrical-reasoning-applied-s02-q02: Two equal resistors in parallel give half the value of one: 3 ohm. Adding a parallel path always lowers total resistance below the smallest branch, so any answer of 6 ohm or more can be ruled out before calculating.

electrical-reasoning-applied-s02-q03: One path means one current everywhere; the supply voltage is shared out in proportion to each resistance. The last option is the near-miss: the current really is the same everywhere, but the voltages are only equal if the resistances happen to be equal.

electrical-reasoning-applied-s02-q04: Only a series string loses every lamp to a single failure, because all the current must pass through each one. In parallel each lamp has its own path, so a failed lamp leaves the rest lit, which is exactly why modern strings are wired that way.

electrical-reasoning-applied-s02-q05: Each parallel branch sits directly across the supply, so removing one branch does not change the voltage across the other; only the total current drawn falls. 'Brighter' imports a series intuition, where removing one lamp would leave more voltage for the rest.

electrical-reasoning-applied-s03-q01: A fuse is a deliberately weak link: its element melts and opens the circuit before the cable it protects can overheat. A diode also fails when overloaded, but that is a failure rather than its designed protective function.

electrical-reasoning-applied-s03-q02: A diode conducts when forward-biased and blocks when reverse-biased, which is what makes rectification and reverse-polarity protection possible. Storing charge is a capacitor's job, and changing an alternating voltage is a transformer's.

electrical-reasoning-applied-s03-q03: Two-way switches route the supply down one of two travellers, so either switch changes the state regardless of the other's position. Two ordinary on/off switches in series would need both to be on, so the downstairs switch could veto the upstairs one.

electrical-reasoning-applied-s03-q04: Voltage scales with the turns ratio, so 240 / 20 = 12 V. The 4800 V answer multiplies, which is what a 1:20 step-up transformer would do. The order of the ratio is the whole question.

electrical-reasoning-applied-s03-q05: Current flows only while the capacitor's charge is changing; once it matches the supply voltage the flow stops. It does behave a little like a resistor while charging, which is why the fixed-resistor answer tempts, but the opposition changes with time rather than staying fixed.

electrical-reasoning-applied-s04-q01: Breakers trip instantly on the magnetic element, which responds to the very high current of a short; a gradual overload trips the thermal element after a delay. Cumulative load elsewhere is the tempting answer, but it would produce a slow trip and would not track one appliance so exactly.

electrical-reasoning-applied-s04-q02: An RCD compares the two conductors: any imbalance means current is returning by some other route, possibly through a person, and it disconnects in milliseconds. Overload protection is the breaker's job: the two devices guard different hazards, which is why circuits usually carry both.

electrical-reasoning-applied-s04-q03: Isolation is only safe when nobody can restore it and when you have confirmed both that the circuit is dead and that your tester still works. Switching off at the appliance is the plausible near-miss: it leaves the supply live up to the switch, and a local switch can be turned back on by anyone.

electrical-reasoning-applied-s04-q04: The cable's own resistance drops part of the supply voltage, leaving less across the lamp: worse with length, better with thicker conductors, and worse still with the reel left coiled. An oversized fuse is a genuine hazard but would not dim the lamp; a fuse either carries the current or opens.

electrical-reasoning-applied-s04-q05: Continuity testing puts a small current through the conductor and measures its resistance, so an intact copper path reads near zero and a break reads open. The voltage answer describes a live test, which is the opposite of what a continuity check requires. The lead must be dead and disconnected.
