Original Regents practice exams

12 independent original forms. Each has 8 selected responses and 4 written tasks.

Algebra I	2 – 5
Geometry	6 – 9
Algebra II	10 – 13
English Language Arts	14 – 19
Global History and Geography II	20 – 24
U.S. History and Government	25 – 31
Life Science: Biology	32 – 35
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Physical Science: Chemistry	40 – 43
Physical Science: Physics	44 – 47
Physical Setting/Chemistry	48 – 51
Physical Setting/Physics	52 – 55

Choose your course. Mark one answer per selected response and show your reasoning on the page.

Measure initial performance privately or use after the preparation series.

Two delivery plans

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

For n whole deliveries, Route A costs 12 + 3n dollars and Route B costs 5n dollars. A shop can order from either route.

1. What does 12 represent for Route A?

- ○ A The number of free deliveries
- ○ B The price per delivery
- ○ C The fixed charge before any deliveries
- ○ D The largest order allowed

2. Which range makes Route B strictly cheaper?

- ○ A Exactly 6 deliveries
- ○ B 0 through 5 deliveries
- ○ C 6 or more deliveries
- ○ D More than 6 deliveries

3. A manager claims the plans always differ by $12. Test the claim at two order sizes and explain why the difference changes.

An arch in the courtyard

Use the stimulus and your course knowledge.

Name _____ **Date** _____

The height of a model arch is $h(x) = -x^2 + 8x$ feet, where x is horizontal distance in feet, measured from the left base. Use the portion on or above the ground.

4. Which expression is equivalent to h(x)?

- ○ A $-x(x + 8)$
- ○ B $x(x - 8)$
- ○ C $(8 - x)^2$
- ○ D $x(8 - x)$

5. Which interval is the physical domain?

- ○ A All real numbers
- ○ B $0 \le x \le 16$
- ○ C $-8 \le x \le 8$
- ○ D $0 \le x \le 8$

6. An opening must be at least 12 feet high. Find the full interval of horizontal positions that satisfy the requirement and justify both endpoints.

Two sets of repair times

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Shop A recorded five repair times in minutes: 8, 9, 10, 11, 12. Shop B recorded 4, 7, 10, 13, 16. Times within each set are equally weighted.

7. Which statistic has the same value for both shops?

- ○ A Standard deviation
- ○ B Median
- ○ C Range
- ○ D Maximum

8. If A adds a 40-minute repair, what is its new mean?

- ○ A 15 minutes
- ○ B 18 minutes
- ○ C 10.5 minutes
- ○ D 9 minutes

9. Before the extra repair, a supervisor said the shops were equally consistent because their means matched. Evaluate the reasoning using numerical evidence.

Admission at the winter show

Use the stimulus and your course knowledge.

Name _____ **Date** _____

On Friday, 3 adult tickets and 2 student tickets cost $58 altogether. On Saturday, 2 adult tickets and 5 student tickets cost $79. Individual prices were the same on both days.

10. What does the coefficient 5 represent in the Saturday equation?

- ○ A Number of student tickets
- ○ B Number of adult tickets
- ○ C Total Saturday student revenue
- ○ D Price of each student ticket

11. If a student ticket price were given, which information would still be needed to find an adult price from the Friday receipt?

- ○ A Only the number of days
- ○ B Only the combined number of Friday tickets
- ○ C Friday total and both Friday quantities
- ○ D Only the Saturday student quantity

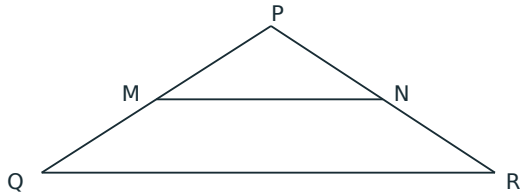
12. A buyer proposes $10 per adult and $14 per student. Define variables, model both receipts, test the proposal against both, and solve for the actual prices. Verify your final pair.

From a drawing to a theorem

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

In triangle PQR, points M and N are the midpoints of PQ and PR. QR is 18 cm long. No right angle is given.



1. Which conclusion follows from the midpoint theorem?

- ○ A MN is perpendicular to QR
- ○ B PQ equals PR
- ○ C MN is parallel to QR
- ○ D Angle P is a right angle

2. Which scale factor maps triangle PQR to PMN by dilation centered at P?

- ○ A 1/2
- ○ B 1
- ○ C 1/4
- ○ D 2

3. Find MN and compare the areas of triangles PMN and PQR. Explain why area changes by that factor.

A cable and a tower

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A straight cable joins the top of a vertical tower to level ground 24 m from its base. The cable makes a 35° angle with the ground. Ignore sag.

4. Which expression gives the height?

- ○ A 24 tan 35°
- ○ B 24 sin 35°
- ○ C 24 cos 35°
- ○ D 24 / tan 35°

5. Which expression gives the cable length?

- ○ A 24 / sin 35°
- ○ B 24 / cos 35°
- ○ C 24 cos 35°
- ○ D 24 tan 35°

6. Without changing tower height, move the ground anchor closer. Predict the change in cable length and ground angle. Justify both.

Circular window

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A sector of a circle has radius 9 inches and central angle 80°. A second sector is similar, with radius 18 inches.

7. What fraction of the first circle is its sector?

- ○ A 4/9
- ○ B 1/9
- ○ C 9/2
- ○ D 2/9

8. What is the area of the first sector?

- ○ A 36π in²
- ○ B 18π in²
- ○ C 4π in²
- ○ D 81π in²

9. Calculate the arc length in each sector. Explain how their ratio compares with the ratio of the two areas.

A classification that needs proof

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Quadrilateral KLMN has consecutive vertices K(0,0), L(4,2), M(3,4), N(−1,2). Use exact coordinates and justify conclusions.

10. Which value is the slope of KL?

- ○ A −1/2
- ○ B −2
- ○ C 1/2
- ○ D 2

11. Which is the midpoint of KM?

- ○ A (1.5, 4)
- ○ B (−0.5, 1)
- ○ C (3, 2)
- ○ D (1.5, 2)

12. Prove KLMN is a rectangle. Then decide whether it is a square. Give enough evidence for each conclusion.

Which expressions share a graph?

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

Let $f(x) = (x^2 - 4)/(x - 2)$. Let $g(x) = x + 2$. Consider real inputs.

1. At which input is f undefined?

- ○ A -2
- ○ B 2
- ○ C 0
- ○ D 4

2. Which point lies on g but is absent from f?

- ○ A (0,2)
- ○ B (−2,0)
- ○ C (4,6)
- ○ D (2,4)

3. Solve f(x) = 0 and explain why multiplying through by the denominator can produce a candidate you must reject.

Trial runs at a station

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A machine has a failure probability of 0.10 on each run. The model assumes independent runs with the same probability.

4. What is the probability of no failures in four runs?

- ○ A 0.1^4
- ○ B 0.9^4
- ○ C $4(0.1)$
- ○ D $1 - 0.9^4$

5. Which observation would most directly call independence into question?

- ○ A Failures cluster immediately after a preceding failure
- ○ B The sample contains both outcomes
- ○ C The proportion varies slightly between samples
- ○ D Some groups of four have zero failures

6. Find the probability of exactly one failure in four runs. Show why the number of possible positions matters.

Two representations of a cycle

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A temperature model is $T(t) = 12 + 5\cos(\pi t/6)$, where t is measured in hours and the cosine argument is in radians. Temperature is in °C.

7. What is the period?

- ○ A 6 hours
- ○ B 2π hours
- ○ C 12 hours
- ○ D 5 hours

8. At what positive time does the model first reach its minimum?

- ○ A 6 hours
- ○ B 12 hours
- ○ C 3 hours
- ○ D 9 hours

9. A sensor reads 12 °C at two different times in the first cycle. Find both times and explain what differs about the temperature trend.

Cooling between readings

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A sample temperature is C(t) = 18 + 72(1/2)^(t/8), with t in minutes after cooling starts. A machine may resume at 30 °C or colder.

10. Which temperature does the model approach over time?

- ○ A 0 °C
- ○ B 72 °C
- ○ C 18 °C
- ○ D 90 °C

11. What quantity halves every eight minutes?

- ○ A The ambient temperature
- ○ B The entire sample temperature
- ○ C The elapsed time
- ○ D The difference between sample and ambient temperature

12. Find the average rate of change over the first 16 minutes and interpret it. Find the earliest whole minute at which the machine may resume. Justify the rounding decision.

The drawers • original fiction

Suggested time for the entire exam: 75–100 min; divide across two periods if needed.

Name _____ **Date** _____

When the repair shop closed, Lena carried home the little drawers that had stood behind the counter. Each brass handle held a slip in her father's narrow handwriting: springs, washers, things to try. She sorted the first two into jars. The third drawer contained a bent key, a spool with no thread and a bus ticket punched clear through the printed number. “Junk,” her brother said, and reached past her. Lena pulled the drawer onto her lap. For years customers had come to that counter with radios that hissed or clocks that struck thirteen. Her father would open this drawer before admitting defeat. Now the shop window wore brown paper. Across the street, a child wrestled with the latch on a red lunchbox. Lena took the bent key out to the curb. She had no idea whether it would fit beneath the catch. Behind her, through the open kitchen window, she could see the empty drawer waiting.

1. Which detail most strongly establishes the father’s attitude toward uncertain repairs?

- ○ A The label “things to try”
- ○ B The shop window’s location
- ○ C The ticket’s missing number alone
- ○ D The jars holding sorted washers

2. What is the effect of “wore brown paper”?

- ○ A The paper suggests that someone has repaired the glass.
- ○ B The shop seems marked by its closure like a person in changed clothing.
- ○ C The phrase introduces a change in narrator.
- ○ D The shop is described as newly decorated for customers.

3. Explain how Lena’s response to the drawer changes. Use an early and a late detail, then explain the connection.

The absent number • original informational text

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A city once reported an impressive library figure: every day that June, all available study rooms had been reserved. The figure said something real about the rooms. It said much less about the people outside them. The booking system recorded a success when a reader secured a room. A reader who found no openings simply closed the calendar, leaving no trace. When staff put a paper request box near the entrance, they collected thirty requests for unavailable times in a week. Even this count had a blind spot: a commuter looking from home could never see the box. Improving a public service sometimes begins by asking which experience its records are built to preserve.

4. Why does the writer introduce the request box?

- ○ A To show that remote readers rarely need rooms
- ○ B To establish the exact number of readers turned away citywide
- ○ C To show that a new measure can reveal missing demand yet still omit some readers
- ○ D To argue that reservations should be abolished

5. What does “blind spot” refer to in context?

- ○ A An inconvenient room location
- ○ B A booking entered for the wrong time
- ○ C A reader’s deliberate refusal to answer
- ○ D An experience the method cannot register

6. Compare how the writers use an absence in “The drawers” and “The absent number.” Support a claim about purpose in each text.

Text analysis • return to the fiction

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Use “The drawers” on the first page. Read the ending alongside the early sorting scene.

7. Which inference about the ending is best supported?

- ○ A Lena has proved the key opens the lunchbox.
- ○ B Lena can continue a practice even without certainty about the outcome.
- ○ C The brother has decided to learn repair.
- ○ D Lena plans to reopen the shop that afternoon.

8. How does the final image of the waiting drawer contribute to the passage?

- ○ A It identifies a new physical obstacle at the curb.
- ○ B It resolves the mechanical problem with the latch.
- ○ C It gives an ordinary object an ongoing role beyond storing the past.
- ○ D It reveals that Lena regrets giving up the key.

9. Write a developed text analysis. Establish a central idea and analyze how one writing strategy develops it. Use at least two precise details. Explain their effect rather than retelling the plot.

Use this space to plan. Continue your response on the next page.

Written response

Question 9 • Text analysis • return to the fiction. Use additional paper as needed.

Name _____ **Date** _____

Source-based argument • a town archive

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Four original simulated sources about a proposed local archive. A / Survey: 96 of 120 respondents want photographs searchable online. The survey link appeared only on the archive website. B / Budget: the same grant could digitize 600 photographs or staff twelve neighborhood scanning days. It cannot fully fund both proposals. C / Pilot: four scanning days at two neighborhood sites collected 78 photographs from 19 households. Eleven households had never donated before. D / Donor interview: one donor welcomed preservation but wanted relatives consulted before family photographs appeared online. The archive has no current procedure for obtaining separate display permission.

10. Which question does Source C answer most directly?

- ○ A Did the pilot reach households new to the collection?
- ○ B Did all donors authorize online display?
- ○ C What is the cost per photograph under both proposals?
- ○ D Would all town residents prefer scanning days?

11. Which evidence most directly qualifies the survey's reach?

- ○ A Its report included the number of participants.
- ○ B Its respondents answered a question about photographs.
- ○ C Some residents may own paper photographs.
- ○ D Its recruitment was limited to archive website users.

12. Write an argument recommending how the archive should use the grant. Use evidence from at least three sources, identify each source by letter, and address a counterclaim. Explain the limits of one source. Either proposal or a justified scaled combination is defensible.

Use this space to plan. Continue your response on the next page.

Written response

Question 12 • Source-based argument • a town archive. Use additional paper as needed.

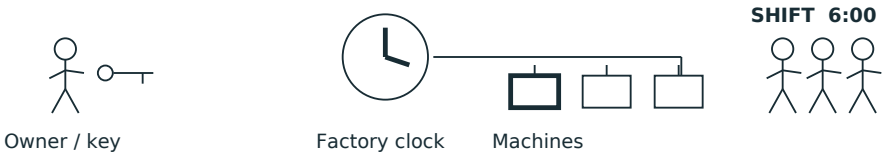
Name _____ **Date** _____

Document 1 • the factory clock

Suggested time for the entire exam: 75–100 min; divide across two periods if needed.

Name _____ **Date** _____

Original editorial cartoon for this practice exam. A large clock runs a row of factory machines. On one side an owner holds the clock key; on the other side workers stand beneath a sign announcing the shift. The caption reads “Who owns the hours?” Interpret it as a constructed view of industrialization in nineteenth-century Britain.



1. Which relationship is the cartoonist emphasizing?

- ○ A Workers generally set factory hours through direct votes.
- ○ B Machines made timekeeping unnecessary.
- ○ C Control of production can also give employers power over workers’ time.
- ○ D Factory owners opposed all scheduled shifts.

2. Which source would best test how closely schedules were followed at one mill?

- ○ A A later drawing of a steam engine
- ○ B A map showing coal deposits alone
- ○ C Dated time books and worker testimony from that mill
- ○ D A national list of factory names

3. Explain the cartoonist’s point of view using two visual details. Identify one limit of this cartoon as evidence about actual workers’ experiences.

Document 2 • law and enforcement

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Historical summary of the British Factory Act of 1833. Parliament placed limits on child labor in covered factories and provided inspectors to enforce the law. Document 1 offers a critical interpretation of power inside a mill; Document 2 describes a government response.

4. Which change does the law most clearly illustrate?

- ○ A Government assumed a larger role in conditions within covered factories.
- ○ B Parliament replaced factory owners as operators of all mills.
- ○ C Workers acquired direct control of every inspection.
- ○ D Industrial production shifted back to homes.

5. What further evidence would most directly measure implementation?

- ○ A A factory owner’s portrait
- ○ B Comparisons of inspection findings and hours actually worked over time
- ○ C The number of pages in the statute
- ○ D The date the law was printed

6. Explain a historical circumstance that helps account for Document 2. Then explain how the issue in Document 1 and the policy in Document 2 are related.

Documents 3 and 4 • a commodity and a campaign

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Document 3 / Historical summary: British colonial authorities in India controlled salt production and imposed a salt tax. In 1930 Gandhi and other marchers traveled to the coast and challenged those rules. Document 4 / Original interpretive sketch: a packet of salt sits on one pan of a scale. The other pan is labeled “authority to make the rules.” The pans balance. The sketch comments on the campaign’s political meaning.



7. Why was salt a useful focus for mobilization?

- ○ A Its political significance depended on the absence of a tax.
- ○ B It linked an ordinary necessity to colonial authority.
- ○ C It was produced exclusively in Europe.
- ○ D Only officials were permitted to consume it.

8. Which interpretation best fits the balanced pans?

- ○ A Colonial taxation had no effect on ordinary life.
- ○ B Salt and government had equal market prices.
- ○ C The march immediately transferred all state power.
- ○ D A dispute over salt could also be a dispute over political authority.

9. Explain the difference between evidence that a rule was challenged and evidence that political power changed. Use Document 3, then identify evidence needed for the second claim.

Document 5 • formal independence

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Historical summary: India became independent in 1947 and Ghana in 1957. Former colonies faced continuing choices about political institutions and economic relationships after independence. Use Documents 1–5 across the four pages for the essay.

10. Which statement is directly supported by Document 5?

- ○ A The timeline of formal independence varied across places.
- ○ B All colonial institutions disappeared immediately.
- ○ C All economic ties ended on the date of independence.
- ○ D The two states used identical political settlements.

11. Which comparison would best investigate economic continuity after independence?

- ○ A A flag design from each country
- ○ B The geographic distance between the capitals
- ○ C Only one year of election results
- ○ D Export destinations before and after independence in the same country

12. Write an enduring-issues essay. Identify and define an issue raised by these documents. Explain its significance, its effect on people, and how it persisted or changed across time or place. Use evidence from at least three documents and relevant outside historical knowledge.

Use this space to plan. Continue your response on the next page.

Written response

Question 12 • Document 5 • formal independence. Use additional paper as needed.

Name _____ **Date** _____

Set 1 • the Tennessee Valley

Suggested time for the entire exam: 75–100 min; divide across two periods if needed.

Name _____ **Date** _____

Document A / Historical summary: during the Great Depression many Tennessee Valley communities faced poverty, soil erosion and limited access to electricity. Document B / Law summary: Congress established the Tennessee Valley Authority in 1933. Its responsibilities included improving navigation, controlling floods and producing electric power. Use A and B together.

1. Which development best situates Document B?

- ○ A Reconstruction established military districts in the South.
- ○ B The United States entered World War I.
- ○ C The Progressive Era ended public utility regulation.
- ○ D The New Deal expanded federal involvement in economic recovery.

2. Which measure would best test progress toward one TVA goal?

- ○ A Changes over time in households connected to electric power in the region
- ○ B The total U.S. population in 1790
- ○ C The number of existing state borders
- ○ D The number of words in the TVA Act

3. Write a short essay describing the historical context and explaining a cause-and-effect relationship between A and B. Use details from both.

Use this space to plan. Continue your response on the next page.

Written response

Question 3 • Set 1 • the Tennessee Valley. Use additional paper as needed.

Name _____ **Date** _____

Set 2 • what does a photograph establish?

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Document C / Historical summary: civil rights organizers and allies marched from Selma toward Montgomery in 1965 to press for voting rights. Document D / Simulated editor's note: a newspaper selects a photograph of orderly marchers with voting-rights signs for its front page. The editor says the picture makes the participants' goal immediately visible. D is a teaching reconstruction, not an archival quotation.

4. For which inquiry would the photograph described in D be most useful?

- ○ A Whether every demonstration proceeded in the same way
- ○ B How a newspaper represented the marchers' public message
- ○ C What proportion of Alabama voters privately agreed
- ○ D How every participant voted afterward

5. Which additional source would most help investigate decisions about coverage?

- ○ A The editor's correspondence comparing candidate photographs
- ○ B A list of all state capitals
- ○ C Only the distance from Selma to Montgomery
- ○ D Only the circulation figure for a different decade

6. Write a short essay explaining the voting-rights context of C and how the intended audience or purpose described in D affects the usefulness of the image for one specific inquiry.

Use this space to plan. Continue your response on the next page.

Written response

Question 6 • Set 2 • what does a photograph establish?. Use additional paper as needed.

Name _____ **Date** _____

Civic dossier • legal protection and access

Use the stimulus and your course knowledge.

Name _____ **Date** _____

E1 / The Fifteenth Amendment, ratified in 1870, prohibited denying or abridging voting rights on account of race, color or previous servitude. E2 / Historical summary: discriminatory registration barriers in parts of the South persisted despite this protection. E3 / Movement summary: voter-registration organizers and the Selma marches made barriers to registration a national issue.

7. Which tension connects E1 and E2?

- ○ A States lost all responsibility for elections in 1870.
- ○ B The amendment expressly required literacy tests.
- ○ C Organizers wanted to abolish voter registration nationwide.
- ○ D A formal constitutional protection coexisted with barriers in practice.

8. Which action in E3 is an example of civic participation outside elected office?

- ○ A Issuing a judicial order
- ○ B Ratifying a constitutional amendment as a state legislature
- ○ C Organizing a march to press for reform
- ○ D Signing a bill into federal law

9. Answer both document questions. What problem persisted according to E2? Explain how one action in E3 could increase pressure for change.

Civic dossier • enforcement and evaluation

Use the stimulus and your course knowledge.

Name _____ **Date** _____

E4 / Law summary: the Voting Rights Act of 1965 supplied federal enforcement tools aimed at discriminatory voting practices. E5 / Method note: comparing voter-registration records before and after implementation can help assess changes in access. E6 / Method note: registration counts alone cannot show whether everyone eligible could vote free from intimidation. E5 and E6 are original analytical notes. Refer to E1–E6 and C for the essay.

10. Which claim is most directly supported by E4?

- ○ A Every barrier disappeared immediately.
- ○ B Registration became identical in every state.
- ○ C The federal response added enforcement mechanisms.
- ○ D The Fifteenth Amendment was repealed.

11. What evidence would best strengthen the evaluation in E5 and E6?

- ○ A A single total with no eligible population size
- ○ B Comparable registration rates and accounts from affected voters over time
- ○ C A photograph of the signing alone
- ○ D An opinion about voting from a different century

12. Write a civic literacy essay about efforts to secure voting access. Explain the historical circumstances, actions taken by people or government, and the extent to which the efforts succeeded. Use at least four dossier documents or summaries and relevant outside information. Identify evidence needed for any broader claim about impact.

Use this space to plan. Continue your response on the next page.

Written response

Question 12 • Civic dossier • enforcement and evaluation. Use additional paper as needed.

Name _____ **Date** _____

Sunlight at the marsh

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

In equal-volume transparent jars, teams placed the same mass of aquatic plants. At the start, dissolved oxygen was 6.0 mg/L in every jar. After four hours, oxygen was 8.4 in bright light, 6.8 in dim light and 5.2 in darkness. Water temperature stayed constant. These are simulated observations.

Condition	Start (mg/L)	After 4 h (mg/L)
Bright	6.0	8.4
Dim	6.0	6.8
Dark	6.0	5.2

1. Which comparison best isolates the influence of light among the tested conditions?

- ○ A The number of jars versus the starting concentration
- ○ B Bright-jar oxygen versus the plant’s mass
- ○ C Water temperature versus the mass of a dry jar
- ○ D Oxygen change in bright versus dim jars with equal plant mass

2. Which statement best explains the dark-jar pattern?

- ○ A Respiration requires bright light.
- ○ B Respiration can consume oxygen in darkness.
- ○ C All plant cells stopped chemical reactions.
- ○ D Water cannot hold oxygen in darkness.

3. A team claims that plants respire only in the dark. Evaluate what these oxygen data can establish. Use values and a process explanation.

Seeds after a dry season

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A population has inherited variation in root depth. Before a drought, 30 of 100 plants sampled had deep roots. In the drought, deep-rooted plants averaged 8 surviving seeds per plant and shallow-rooted plants averaged 3. After several generations, 52 of 100 sampled plants had deep roots.

4. Which observation is directly relevant to differential reproductive success?

- ○ A Both samples had exactly 100 plants.
- ○ B Root depth can be measured in centimeters.
- ○ C The site was sampled more than once.
- ○ D The two root groups produced different numbers of surviving seeds.

5. Which additional observation would most weaken selection as the sole explanation for the frequency change?

- ○ A Observers used the same depth definition at both samplings.
- ○ B Some shallow-rooted plants produced seeds.
- ○ C Many deep-rooted seeds were carried into the population from another site.
- ○ D Both groups flowered during the same month.

6. Use the evidence to explain how deep roots could become more frequent. Distinguish a change in a population from a change in one individual.

An inherited seed pattern

Use the stimulus and your course knowledge.

Name _____ **Date** _____

In a simplified plant model, allele P gives purple seed coats and is completely dominant over p. Two purple heterozygous parents are crossed. Assume ordinary Mendelian segregation with no survival differences.

7. What fraction of offspring are expected to be purple heterozygotes?

- ○ A 1/2
- ○ B 1/4
- ○ C 3/4
- ○ D 1

8. A purple offspring is crossed with pp and produces at least one nonpurple offspring. What follows under the model?

- ○ A The purple parent contributed p and is Pp.
- ○ B Every future offspring will be nonpurple.
- ○ C The nonpurple offspring has genotype Pp.
- ○ D The purple parent must be PP.

9. A class observes six purple offspring and no nonpurple offspring from the original Pp × Pp cross. Is that observation impossible? Support your reasoning with the expected ratio or a probability.

Restoring a stream bank

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Four matched stream sections received native plants and four were left unchanged. Both groups averaged 12 aquatic insect species before planting. One year later, planted sections averaged 18 species and comparison sections averaged 13. Planted sites also had cooler water. The team proposes that added shade caused the species increase.

10. Which result best summarizes the change relative to comparison sites?

- ○ A A thirteen-species decline at comparison sites
- ○ B A five-species larger average gain in planted sections
- ○ C An eighteen-species gain caused by shade
- ○ D A six-species gain in both groups

11. Which design best tests temperature as a mechanism?

- ○ A Remove all comparison measurements.
- ○ B Count species once only in the coolest planted section.
- ○ C Manipulate shading across similar sections and measure both temperature and species richness.
- ○ D Assume that any planted site has identical food availability.

12. Write a supported restoration claim and one reason the observations leave the mechanism uncertain.

Tracing a storm through a basin

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

Hourly readings at a stream gauge are 4, 5, 11, 16 and 9 m³/s at noon, 1, 2, 3 and 4 p.m. The heaviest rain over the upstream basin occurred at 1 p.m. The values are simulated.

Time	Noon	1 p.m.	2 p.m.	3 p.m.	4 p.m.
Flow (m³/s)	4	5	11	16	9

1. What is the lag from heaviest rain to the highest measured discharge?

- ○ A 1 h
- ○ B 4 h
- ○ C 3 h
- ○ D 2 h

2. Which change would generally shorten travel time to the channel during a comparable storm?

- ○ A Increasing infiltration into unsaturated soil
- ○ B Restoring storage in floodplain wetlands
- ○ C Increasing deep soil storage
- ○ D Replacing permeable soil with connected paved drains

3. Explain a process that can account for the lag. Predict how a detention basin that releases water slowly could change the peak under otherwise similar conditions.

An ocean-floor transect

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A ridge lies at distance 0. At 40, 80 and 120 km on its east side the crust is 2, 4 and 6 million years old. On the west side rocks of the same ages occur at the corresponding distances. Assume rates were approximately constant.

4. What is the mean outward speed for one side?

- ○ A 2 cm/year
- ○ B 0.2 cm/year
- ○ C 4 cm/year
- ○ D 20 cm/year

5. Which observation most strongly supports formation of new crust at the ridge?

- ○ A Crust becomes older away from the ridge on both sides.
- ○ B The six samples have different distances.
- ○ C The data table includes ages in millions of years.
- ○ D Each sample was collected on Earth.

6. Predict the distance between two pieces of same-age crust, one on each side, after 8 million years at the stated rates. Explain the distinction between plate speed and total separation.

The star’s missing light

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A monitored star has a stable baseline brightness. Dips of almost identical size recur on days 2, 8, 14 and 20. Each lasts about 3 hours. A second proposed orbit model predicts a transit every 4 days. Assume continuous observing and no missed transits.

7. Which period best fits the dip sequence?

- ○ A 18 days
- ○ B 6 days
- ○ C 3 hours
- ○ D 8 days

8. What is the strongest reason to question the 4-day model?

- ○ A The first observation occurred after day zero.
- ○ B It predicts dips at times with no observed dips.
- ○ C It uses calendar days instead of hours.
- ○ D It predicts the star must be smaller than Earth.

9. Predict the next dip after day 20. Explain why repeated dimming is consistent with an orbiting body, and give one observation that would test the prediction.

Reading a rock record

Use the stimulus and your course knowledge.

Name _____ **Date** _____

In an undisturbed sequence, sandstone S is beneath shale H. A dike D cuts both. An erosion surface truncates S, H and D. A horizontal limestone L was deposited above that surface. Fossils in L are marine.

10. Which event must predate the intrusion?

- ○ A Formation of fossils within L
- ○ B Deposition of L
- ○ C Deposition of H
- ○ D Erosion that truncated D

11. Which conclusion is supported by the fossils in L?

- ○ A The exact age of L is known from the word marine.
- ○ B The dike was deposited by waves.
- ○ C Marine deposition occurred at that site when L formed.
- ○ D Every underlying layer formed in deep water.

12. Order the deposition and disturbance events from earliest to latest. Identify where time is missing from the rock record and explain how you know.

What the particles can make

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

A closed particle model contains 6 CO molecules and 4 O_2 molecules. It follows the reaction $2CO + O_2 \rightarrow 2CO_2$ until the limiting reactant runs out. All counts are molecule counts.

1. Which reactant runs out first?

- ○ A Both at exactly the same time
- ○ B CO
- ○ C O_2
- ○ D Neither can react in a closed model

2. Which count is conserved for the complete closed model?

- ○ A Number of CO_2 molecules
- ○ B Number of molecules of CO
- ○ C Total number of molecules
- ○ D Number of oxygen atoms

3. Describe or draw the final particle inventory. Verify oxygen conservation by counting atoms before and after.

Two cooling sleeves

Use the stimulus and your course knowledge.

Name _____ **Date** _____

In a simulated design test, equal volumes of water at 22 °C surround two sealed packs. After activation the water near X falls to 15 °C and near Y to 19 °C. An unactivated control stays near 22 °C. The test uses equal pack masses and equal exposure times.

4. If the pack process is the system, which direction of transfer fits the water near X?

- ○ A Energy moved from surrounding water into the pack.
- ○ B The pack added thermal energy to the water.
- ○ C Energy was destroyed as the water cooled.
- ○ D No energy moved because the pack was sealed.

5. Which result would test a separate design criterion of duration?

- ○ A The initial color of each pack
- ○ B Repeating only the starting temperature
- ○ C Counting the letters in the ingredient names
- ○ D Temperature readings at regular intervals for 45 minutes

6. Choose a pack when the sole criterion is the largest water-temperature drop at the measured time. Use both trials and explain one limit of your recommendation.

Reaction time across temperatures

Use the stimulus and your course knowledge.

Name _____ **Date** _____

At equal reactant amounts and concentrations, the times to the same visible endpoint are 140 s at 290 K, 96 s at 300 K and 65 s at 310 K. Each value is the median of three trials.

Temperature (K)	290	300	310
Time (s)	140	96	65

7. Which trial has the highest average progress per second to the endpoint?

- ○ A All rates are equal because the endpoint is the same
- ○ B 310 K
- ○ C 290 K
- ○ D 300 K

8. Why is a common endpoint important?

- ○ A It removes all measurement uncertainty.
- ○ B It ensures identical rates at every instant.
- ○ C It makes elapsed times comparable for the same amount of progress.
- ○ D It proves the reaction is reversible.

9. Evaluate the claim that raising temperature slows this process. Support the verdict numerically and connect it to a particle-level explanation.

Identifying a material

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Solid M does not conduct current, but molten M conducts. Solid N conducts, and its shape can be changed by hammering. An engineer needs a material for a wire at room temperature. Assume both are solid at that temperature.

10. Which model best fits M?

- ○ A Protons moving freely through an atomic nucleus
- ○ B Free-moving electrons throughout the solid and liquid
- ○ C Ions fixed in a solid lattice that become mobile when molten
- ○ D Only neutral particles with no mobile charge in either phase

11. Which observation about N directly supports its electrical use?

- ○ A Its solid state conducts.
- ○ B It is labeled with a single letter.
- ○ C It remains a solid at room temperature by itself.
- ○ D It has been hammered once.

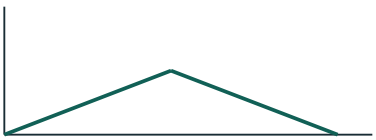
12. Recommend M or N for the wire using two observations. Give a particle-level account consistent with its conductivity and shape change.

Protecting a sensor

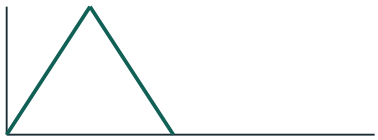
Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

A sensor cart hits two prototype stops in separate trials. It approaches each stop with the same momentum and comes to rest. Model each force pulse as triangular. Stop X gives a peak of 150 N over 0.12 s. Stop Y gives a peak of 300 N over 0.06 s. Use magnitudes.



X 0.12 s / 150 N



Y 0.06 s / 300 N

1. Which quantity is the area under each force-time pulse?

- ○ A Speed
- ○ B Impulse
- ○ C Power
- ○ D Pressure

2. If damage occurs above 200 N, which design meets that constraint in this trial?

- ○ A X only
- ○ B Both
- ○ C Neither
- ○ D Y only

3. Calculate both impulses. Explain how the sensor can experience different peak forces while undergoing the same change in momentum.

Powering the light

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Two lamps each operate at 6.0 V. Lamp A draws 0.40 A and provides a measured useful light output of 0.48 W. Lamp B draws 0.25 A and provides 0.45 W of useful light. Use P = VI and efficiency = useful output / input.

4. Which is the electrical input power for lamp B?

- ○ A 6.25 W
- ○ B 24 W
- ○ C 1.50 W
- ○ D 0.45 W

5. What extra measurement is needed to estimate total input energy for one use at constant power?

- ○ A Color of the lamp housing
- ○ B Ambient light level alone
- ○ C Length of the power cord alone
- ○ D Time switched on

6. Which lamp is more efficient under these conditions? Compare both numerical efficiencies and explain why light output alone is insufficient.

Signals on a string

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A wave travels along a uniform string at 24 m/s. A driver runs at 6 Hz and then 8 Hz while string tension and mass per length stay constant. Use $v = f\lambda$.

7. What is the wavelength at 6 Hz?

- ○ A 0.25 m
- ○ B 144 m
- ○ C 4 m
- ○ D 18 m

8. Which change would most directly increase amplitude without changing frequency in an ideal linear model?

- ○ A Increase the driver’s displacement per oscillation
- ○ B Shorten the time for each cycle
- ○ C Relabel the vertical axis in different units
- ○ D Double the number of oscillations per second

9. Predict the new wavelength and describe the cause of the change using the spacing between crests.

Lens on an inspection stand

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A converging thin lens has focal length 12 cm. A 3 cm object stands 36 cm from the lens. Use $1/f = 1/d_o + 1/d_i$ and magnification magnitude = absolute value of d_i/d_o. A real object beyond the focal point can form a real image.

10. Where is the sharp image?

- ○ A 12 cm on the object side
- ○ B 18 cm from the lens on the opposite side
- ○ C 36 cm on the opposite side
- ○ D 48 cm on the object side

11. Which observation most directly confirms the image is real?

- ○ A The object reflects light.
- ○ B The image looks smaller than the object.
- ○ C The lens is made from transparent material.
- ○ D A screen placed at its location captures a focused image.

12. Find the image height and describe its orientation. Explain what a pair of principal rays from the object tip would show.

A miniature reference table

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

Normal melting and boiling temperatures (°C) at 1 atm: substance X, −95 and 65; substance Y, 5 and 105. An unknown sample is liquid at 20 °C and gas at 80 °C at equilibrium. Use the supplied practice reference throughout this section.

Substance	Melting (°C)	Boiling (°C)
X	−95	65
Y	5	105

1. Which substance matches the observations?

- ○ A X only
- ○ B Y only
- ○ C Both X and Y
- ○ D Neither X nor Y

2. What phase is Y at 0 °C and 1 atm at equilibrium?

- ○ A All phases in equal amounts
- ○ B Gas
- ○ C Solid
- ○ D Liquid

3. Compare the normal boiling points and explain what they suggest about intermolecular attractions, assuming two molecular liquids of similar size.

Atoms in a labeled sample

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A neutral sample contains isotopes Z-24 and Z-26 of element Z, atomic number 12. Their abundances are 75% and 25%. For this exercise use 24 u and 26 u for their masses.

4. How many neutrons are in Z-26?

- ○ A 12
- ○ B 38
- ○ C 26
- ○ D 14

5. Which change forms Z^{2+} from a neutral Z atom?

- ○ A Loss of two protons
- ○ B Gain of two electrons
- ○ C Loss of two electrons
- ○ D Gain of two neutrons

6. Calculate the weighted mean atomic mass and explain why it is closer to one isotope's mass.

An aqueous redox reaction

Use the stimulus and your course knowledge.

Name _____ **Date** _____

The net ionic equation is $Mg(s) + 2Ag^{+}(aq) \rightarrow Mg^{2+}(aq) + 2Ag(s)$. Use the equation to answer all three questions.

7. Which species is reduced?

- ○ A Mg(s)
- ○ B Ag^{+}
- ○ C An electron
- ○ D Mg^{2+}

8. Which is the reducing agent?

- ○ A Mg(s)
- ○ B Ag^{+}
- ○ C Mg^{2+}
- ○ D Ag(s)

9. Write balanced oxidation and reduction half-reactions in compatible multiples. Show how their electron counts relate.

A dissolving and cooling sample

Use the stimulus and your course knowledge.

Name _____ **Date** _____

Practice solubility data for a salt: 24 g per 100 g water at 20 °C and 48 g per 100 g water at 60 °C. A sample has 60 g of salt completely dissolved in 150 g of water at 60 °C. No water evaporates.

10. How much salt could dissolve at most in this water at 60 °C?

- ○ A 48 g
- ○ B 72 g
- ○ C 96 g
- ○ D 60 g

11. How should the initial solution be classified?

- ○ A Supersaturated
- ○ B A suspension of undissolved solid
- ○ C Saturated
- ○ D Unsaturated

12. After cooling to 20 °C and reaching equilibrium, calculate the mass that crystallizes and describe the opposing processes at the solid-solution boundary.

Braking on a level track

Suggested time for the entire exam: 35–50 min; adjust to local conditions.

Name _____ **Date** _____

A 2.0 kg cart’s velocity changes uniformly from +8.0 m/s to +2.0 m/s in 3.0 s. Take its original motion as positive.

1. What is the acceleration?

- ○ A −2.0 m/s²
- ○ B +5.0 m/s²
- ○ C +2.0 m/s²
- ○ D −6.0 m/s²

2. What is the net force during braking?

- ○ A −12 N
- ○ B +10 N
- ○ C −4.0 N
- ○ D +4.0 N

3. Determine displacement and change in kinetic energy. Show substitutions and units, and explain the sign of each result.

A circuit on the bench

Use the stimulus and your course knowledge.

Name _____ **Date** _____

An ideal 18 V battery is connected across 9 Ω and 6 Ω resistors in parallel. Ideal wires and steady operation are assumed. Use V = IR and P = VI.

4. What is the current in the 9 Ω branch?

- ○ A 5 A
- ○ B 3 A
- ○ C 0.5 A
- ○ D 2 A

5. If the 6 Ω branch is disconnected, what happens to the current in the 9 Ω branch?

- ○ A It becomes the original total current.
- ○ B It doubles.
- ○ C It stays the same.
- ○ D It drops to zero.

6. For the original circuit calculate total current, equivalent resistance and total power. Show equations and units.

Refraction at a flat surface

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A light ray goes from air (n = 1.00) into a transparent material (n = 1.40). The incident angle is 40° to the normal. Use $n_1 \sin \theta_1 = n_2 \sin \theta_2$ and $c = 3.00 \times 10^8$ m/s.

7. What is the approximate refracted angle to the normal?

- ○ A 40°
- ○ B 27°
- ○ C 64°
- ○ D 13°

8. Which property remains unchanged as the light enters the material?

- ○ A Frequency
- ○ B Wavelength
- ○ C Speed
- ○ D Angle to the normal

9. Calculate speed in the material. Sketch the interface, normal and rays and label both angles so their reference line is unambiguous.

Excited atoms and emitted light

Use the stimulus and your course knowledge.

Name _____ **Date** _____

A model atom has allowed energies −6.0, −3.0 and −1.0 eV. It begins at −1.0 eV and reaches −6.0 eV, either directly or by way of −3.0 eV. Use 1 eV = 1.60×10^{-19} J and h = 6.63×10^{-34} J·s.

10. What photon energy accompanies the direct transition?

- ○ A −5.0 eV
- ○ B 7.0 eV
- ○ C 1.0 eV
- ○ D 5.0 eV

11. Which path yields two photons?

- ○ A Remaining at −6.0 eV
- ○ B −1.0 → −3.0 → −6.0 eV
- ○ C −1.0 → −6.0 eV directly
- ○ D Remaining at −1.0 eV

12. Find the frequency of the directly emitted photon. Compare its energy with the combined energies of the two photons on the other path.