

**UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE AND ENGINEERING
APS112 TERM TEST – March 26th 1:30pm-2:30pm
60 Minutes. 15% of APS112 Grade.**

INSTRUCTORS: T. Kosteski, B. Kinsella, T. Nolan, C. Runke, R. Khan, J. Bazylak

-----CROWDMARK ID BOX WILL GO HERE-----

****DO NOT REMOVE THE STAPLE****

Do not begin this test unless asked to do so. Do not continue writing once the time is complete. Disregarding these rules will constitute an academic violation.
No unauthorized aids.

PLEASE WRITE CLEARLY AND LEGIBLY

- Students are wholly responsible for the content and quality of this submission.
- Do not separate the pages.
- This is an independent, closed-book assessment.
- Use a pencil or a pen (pencil is recommended in case you make errors).
- No aids permitted other than a paper translation-only dictionary (i.e. direct word-to-word translations; no definitions.)
- Students **must** input answers on the separate bubble sheet at the end of the exam to be graded. Any other work will not be graded (no exceptions).
- Be sure to fill out the bubble page **clearly and darkly with no overlaps**.
- Provide only the single, most correct answer for each question.

Time allotted: **60min**

Type	Maximum Marks
Multiple Choice	30 marks (1 mark per question, 30 questions)
Total	30

**(THIS PAGE IS NOT GRADED AND CAN BE USED FOR ROUGH
NOTES)**

YOU CAN DO THIS.

Instructions: **Students MUST write their correct response on the final page of the test** (the "bubble sheet") for their grade to be valid. Do not write your answer on this question sheet as it will not be graded. The teaching team is not responsible for students failing to do this.

Please review the question(s) carefully and **submit only one (1) most-correct response**. Each correct response is worth one (1) mark.

ALL QUESTIONS MUST BE ANSWERED ON THE BUBBLE SHEET ATTACHED TO THE END OF THIS TEST PACKAGE

1. In an ESP Status Report, the person responsible for a task must:
 - a. Complete the task by the due date.
 - b. Inform the Project Manager if the task is delayed.
 - c. Perform duties required to complete the task.
 - d. Be held accountable for the outcome of the task.
2. An ESP Status Report is improper if:
 - a. A task has multiple predecessor tasks.
 - b. A new task is created without an associated predecessor task.
 - c. There are no strategies to address team issues.
 - d. It contains delayed tasks that were described, but not completed, in a previous status report.
3. An Engineering Notebook:
 - a. Communicates the results of a failed experiment to other engineers.
 - b. Can be used as evidence to prevent a competitor from using your trade secret.
 - c. Can be used as evidence in applying for a Canadian patent to prove that you were first to invent.
 - d. Is dynamic and information can be added or deleted over time.
4. Reverse Engineering can be:
 - a. Only used by a person qualified in the appropriate field of engineering.
 - b. Only done on products that do not contain any patented items.
 - c. Used by a person qualified in the appropriate field of engineering to gain knowledge of a product.
 - d. Used by any person to gain knowledge of a product.
5. A reasonable estimation is achieved when:
 - a. Assumptions are insensitive to the data.
 - b. Every detail of the problem is understood.
 - c. Imprecise data is excluded.
 - d. A precise model is used.

6. Which would be best for a team to describe their planning and progress in a DRG presentation?
- A checklist of all tasks
 - A detailed Gantt chart with all tasks
 - A checklist of milestones
 - A timeline of all tasks, meetings, and deliverables

Table 1: Risk Management Matrix – Seeing Clearly Optics (for Question 7)

Impact	Likelihood	Score	Risk Level	Risk Score	Escalation Level	
					Engineering	Operations
Death	<i>Almost Certain:</i> Has occurred on an annual basis in this organisation in the past	5	Catastrophic	20	Chief Technology Officer (CTO)	Chief Operations Officer (COO)
Hospitalization	<i>Likely:</i> Has occurred in the last 3 years in this organisation	4	High	15	Engineering Manager	Shift Manager
Medical Treatment	<i>Possible:</i> Has occurred at least once in the history of this organisation	3	Medium	10	Shift Engineer	Shift Supervisor
First Aid	<i>Unlikely:</i> Has never occurred in this organisation	2	Low	5	Team Leader responsible to mitigate risk.	
No Injuries	<i>Rare:</i> Is possible, but has not occurred to date in any similar organisations	1	Negligible	1		

7. You are working as a Team Leader at a company manufacturing fibre optic components. On the evening shift, an operator cleaning their workspace with compressed air lodges a glass fibre in their eye. Returning from escorting the operator to the hospital, you inform a senior operator that a short-term replacement operator is needed. You learn from the senior operator that this has happened before “because the compressed air is too strong.” What should be your next action?
- Research the safety standard for compressed air pressure and implement it.
 - Report the incident to the Engineering Manager and Shift Manager.
 - Retrain the operators in the proper method of clearing their workspace.
 - Report the incident to the CTO and COO.

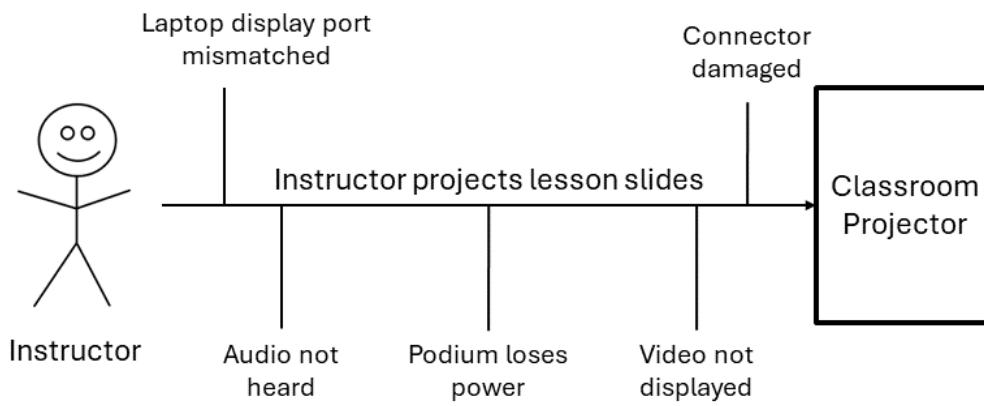


Figure 1: Classroom projector diagram (for Questions 8-9)

8. Figure 1 is an example of a:
 - a. Use Case diagram.
 - b. Black Box diagram.
 - c. Functional Decomposition diagram.
 - d. Graphical Decision diagram.

9. In Figure 1 “Podium loses power” is a(n):
 - a. Actor
 - b. Snapshot
 - c. Function
 - d. Use Case

10. An APS112 team has designed a hybrid, enclosed, all-terrain hand wagon for the transport, storage, and protection of a large tipi (30 ft tall). Their three objectives in order of importance are: 1) Reduce physical effort; 2) Weather resistant; 3) Inexpensive. Which is the best project plan to implement the Measures of Success?
 - a. Calculate the wagon mass. Research the tipi mass and rolling resistance coefficient. Calculate the rolling resistance force.
 - b. Construct a full-scale prototype. Research tipi mass. Load prototype with weights. Use a push-pull gauge to take measurements over a range of terrain.
 - c. Construct a one-tenth scale prototype. Demonstrate use of the design for the client. Ask client if they think it meets their needs.
 - d. Create a Bill of Materials. Add material cost through research. Benchmark assembly costs. Calculate total cost.

11. Your team determines “Low Physical Effort” as a key objective in your design of a tipi transport solution described in Question 10. Which is the best goal?
 - a. <100 lbs - “a man can exert a pressure of 107 lbs”...when dragging an item [1].
 - b. <80 lbf - “max male two-handed push strength is 135 lbf”; female total body strength is, on average 60% of male total body strength [2].
 - c. <50 lbf - “max male two-handed push strength is 135 lbf”; female total body strength ranges from 35% to 85% of that max [2].
 - d. “Operating system must account for limited hand strength” [3].

[1] ‘Human Strength’, Scientific American, Vol 13, Iss 10, 1857.

[2] L. Barnes-Moten, “Human performance capabilities,” NASA, 2024.

[3] “Accessibility Design Standard,” University of Toronto Facilities & Services, 2021.

12. For the Assertion-Evidence style of slide design, claims:
- Should be delivered primarily through spoken content.
 - Should be organized according to the presentation outline.
 - Should be stated in the header of each slide.
 - Should be triangulated and demonstrated through different sources of evidence.
13. For multimodality, our lectures this term differentiated between form and content. According to lecture, what is the best description of how those terms relate?
- The content being communicated determines the form of the communication.
 - Content must be made to fit the expected form of a given situation.
 - Audience needs should not impact the form of your communication.
 - Aptness for a given audience determines the project requirements you present.
14. Three assignments, across ESP I and II, differentiate between the content we expect in observation and analysis sections. What is the best description of how observation and analysis are different?
- Observation should capture every detail while analysis links parts of the observation together.
 - Observation should capture the most relevant details, while analysis links parts of the observation together.
 - Observation should use multimodality to communicate to the audience, while analysis should mostly be in written paragraphs.
 - Observation should be an objective description, while analysis explains why something is how it is, and why it matters.
15. At the beginning of forming a team, what can the Bolton and Bolton Questionnaire help you to understand about your new team members?
- Personality types
 - Cross-cultural communication strategies
 - Working styles
 - Emotional Intelligence (EQ)
16. Your first engineering internship this summer is at a global consultancy firm. Which teamwork concept would be most relevant for increasing team cohesiveness?
- Conflict management skills
 - Cross-cultural communication methods
 - Contingency plans
 - Project management tools

17. Estimate the number of litres of drinking water consumed during a school year (i.e. 8 months) by your first year ESP engineering class. Some information that may be used: there are 200 teams in your first-year class, there are 3 lecture sections held in MY150, there are 8 engineering streams, all of UofT consumed a total of 1.4 million cubic meters of water across its three campuses, and 1 cubic meter = 1000 litres. Select the closest answer.
- 1×10^3 L
 - 1×10^6 L
 - 1×10^9 L
 - 1×10^{12} L
18. Isometric drawings are particularly useful for:
- Showing a 3-dimensional object with perspective.
 - Visualizing complex assemblies.
 - Understanding external shape and form.
 - Showing precise dimensions and tolerances for manufacturing.
19. Orthographic drawings are particularly useful for:
- Representing a 2-dimensional object with perspective.
 - Showing true lengths, where principal axes are separated by 120 degrees.
 - Representing true shapes and dimensions.
 - Projecting a 2-dimensional object into 3-dimensional space.

Table 2: The following figures (A, B, C, and D) are for Questions 20-21

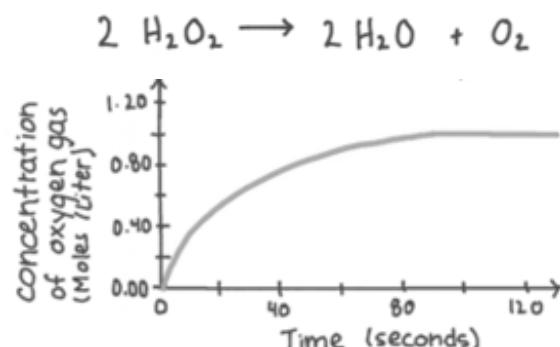


Figure A

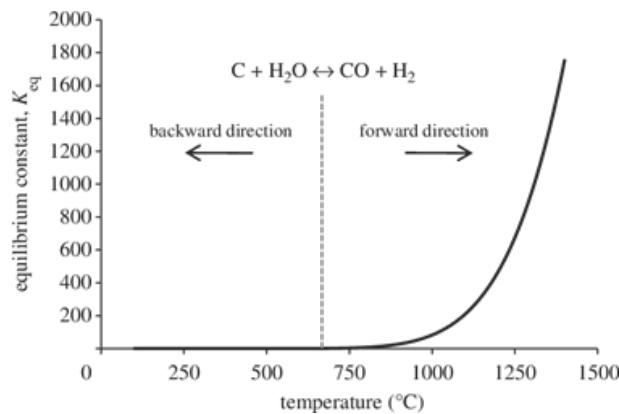


Figure B

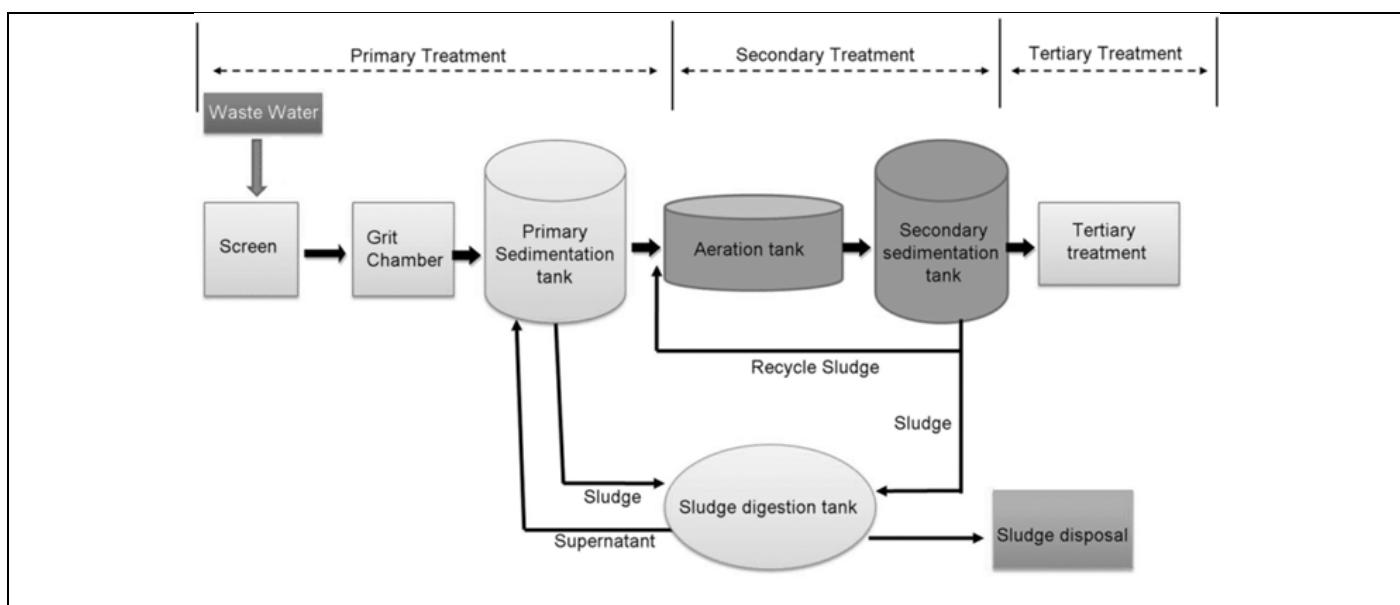


Figure C

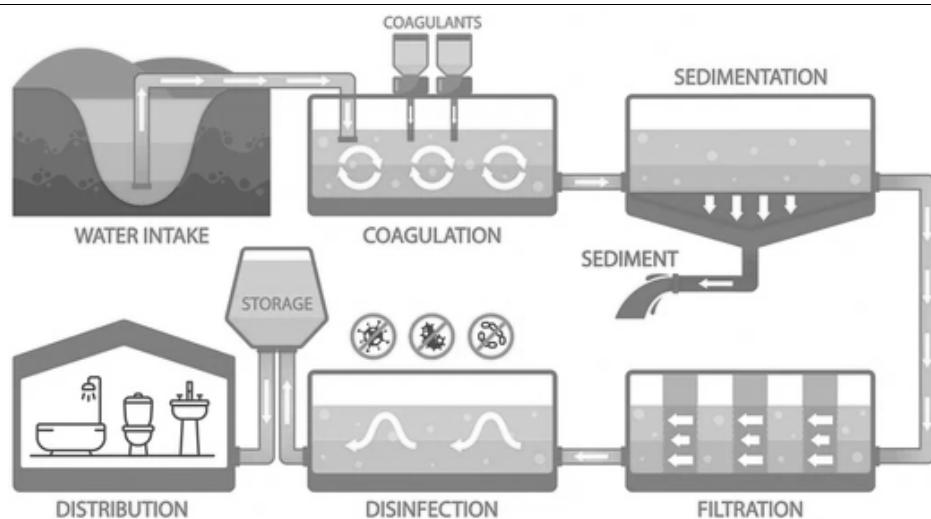


Figure D

20. Which image would be used to describe an experimental result in a CDS?
- Figure A
 - Figure B
 - Figure C
 - Figure D
21. Which image would be used in a DRG for a project on water filtration?
- Figure A
 - Figure B
 - Figure C
 - Figure D

Questions 22-30 refer to the scenario with task list below.

You are almost finished your first year of engineering, and you just remembered that your best friend's birthday is only 10 days away!

Below is a set of tasks that need to be completed to plan a successful birthday party. On the following page, answer the questions based on the given durations and dependencies. The given task numbers **do not** denote any specific order.

Hint: Sketch a Gantt chart to be able to answer the multiple-choice questions more easily.

Task #	Task Description	Duration	Dependencies
1	Choose a time	1 day	
2	Decide on a party theme	2 days	1 – Finish to Start
3	Create a guest list	2 days	2 – Start to Start
4	Choose a venue	3 days	1 – Finish to Start 2 – Finish to Start
5	Send out invitations	1 days	3 – Finish to Start 4 – Finish to Start
6	Plan the menu	3 days	2 – Finish to Start
7	Order the birthday cake	1 days	2 – Finish to Start 6 – Start to Start
8	Arrange entertainment	2 days	2 – Finish to Start
9	Purchase decorations	2 days	2 – Finish to Start 4 – Finish to Finish
10	Set up the venue	1 day	8 – Finish to Start 9 – Finish to Finish

22. What is the duration of the critical path?

- a. 7 days
- b. 8 days
- c. 9 days
- d. 10 days

23. What Task #'s are part of the critical path?

- a. 1, 2, 4, 5
- b. 1, 2, 5, 10
- c. 1, 2, 4, 9, 10
- d. 1, 2, 4, 5, 9, 10

24. Which Task # below has the most slack time?
- 1
 - 3
 - 6
 - 8
25. Which Task # below starts the latest?
- 4
 - 5
 - 9
 - 10
26. Which Task # below ends the latest?
- 3
 - 6
 - 7
 - 8
27. If Task #8 is delayed by 2 days, what happens to the critical path?
- All critical tasks remain the same.
 - Task #8 becomes a critical task, but path duration does not change.
 - Task #8 becomes the last critical task.
 - Task #10 becomes the last critical task.
28. If Task #7 is delayed by 5 days, how many days is the project delayed?
- 0
 - 1
 - 2
 - 3
29. If Task #9 is given 3 days of lead time, how many days earlier does it end?
- 0
 - 1
 - 2
 - 3
30. If Task #8 requires 2 days of lag time, how many days is the critical path extended?
- 0
 - 1
 - 2
 - 3

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DO NOT SEPARATE ANY PAGES.