

QUIZ 1:

[Questions and Answers for EARTH 2415 quizzes 1-4: answers are highlighted]

- Q1) World-wide for a given year, the majority of disaster costs are covered by insurance
a) True
b) False
- Q2) Natural hazards only become natural disasters when they intersect with an invulnerable community
a) True
b) False
- Q3) Emergency management in Canada is a well-established discipline
a) True
b) False
- Q4) A severe hazard associated with a low vulnerability has a lower risk than a severe hazard associated with a high vulnerability
a) True
b) False
- Q5) The Canadian Disaster Database is a website that provides information on the disasters that have occurred in Canada. The purpose of the questions on this website is to show you how to use the database and examine historical events on the website, enter the 'geospatial edition', select "All of Canada", Meteorological– and Geological in event type, 1900 to present (leave blank for present)
a) True
b) False
- Q6) In the Canadian Disaster Database, enter the "geospatial edition", select "All of Canada", "Meteorological-Hydrological" and "Geological" in event type, 1900 to present.
A winter storm has the position as the highest estimated total cost at \$4 635 720 433. The freezing rain caused massive power outages affecting approximately 3 228 750 in Ontario and 1.5M in QC. (Hint: sort by estimated total cost and select the event for more details).
c) True
d) False
- Q7) There is a physical limit for the depth at which an earthquake might occur
a) True
b) False

- Q8) One tectonic cycle takes place over approximately 200M years.
a) True
b) False
- Q9) Scientist can compute tomographic images showing subducting plates
a) True
b) False
- Q10) Most faults are expressed at the surface
a) True
b) False
- Q11) The top layer of soil (0-50km) has a major impact on ground motion such as local site amplification, liquefaction, and landslides
a) True
b) False
- Q12) The 1906 San Francisco earthquakes resulted in fires that did 10 times more damage than the earthquake itself. As a result, officials prefer to describe the event as a “human-made disaster”
a) True
b) False
- Q13) The earthquakes Canada website is the federal government's website to provide information on recent earthquakes, data for scientists, measures for the general public, and more. In the questions associated with this website, we will explore the site's content. Go to products/Research (left column) and open the “Earthquakes in southwestern BC” publication, Earthquakes in the North American plate are the most shallow, and can cause the most damage.
a) True
b) False
- Q14) At the earthquakes Canada website go to Products/Research (left column) and open the “Earthquakes in southwestern BC” publication. This seismic region is known as the Cascadia subduction zone and earthquakes can occur in the subducting Juan de Fuca plate, the over-riding Eurasian plate and at the plate boundary
a) True
b) False
- Q15) Aftershocks can continue for years after the main shock earthquake event.
a) True

b) False

Q16) Which type of natural disaster is increasing in frequency both in Canada and worldwide?

- a) disasters caused by variations in the Earth's magnetic field
- b) geological disasters
- c) impacts with space objects
- d) weather related disasters

Q17) What is the magnetic polarity of lava which cooled 2.5Ma ago (check lecture notes):

- a) zero polarity because the earth did not have a magnetic field at the time
- b) a mix of normal and reverse polarities depending on the minerals present
- c) reverse polarity
- d) normal polarity

Q18) Subduction occurs when

- a) a dense lithospheric plate descends beneath a less-dense lithospheric plate
- b) a lithospheric plate moves above a hot spot
- c) new crust is formed between lithospheric plates
- d) two continents collide

Q19) Building a dyke is an example of

- a) adaptation
- b) migration
- c) preparedness
- d) response

Q20) In the Canadian disaster database, to be defined as a disaster, an event must meet one of the following criteria except

- a) appeal for national/international assistance
- b) 10 or more people affected /injured/infected/evacuated or homeless
- c) historical significance
- d) significant damage such that the community cannot recover on its own

Q21) In the Canadian Disaster Database, geospatial edition, select "All of Canada", Meteorological-Hydrological and Geological 1900 to present. Amongst the top 5 events with the most evacuations, which of the following is FALSE?

Hint: sort by evacuated to have the events listed from highest to lowest fatalities

- a) a flash flood in Southern Alberta in 2013 forced 100,000 individuals to evacuate. The saddledome was used as a place of refuge for those evacuated

- b) A flood in Winnipeg, 1950, led to the evacuation of a third of the city's population
- c) a wild fire led to the evacuation of 90, 000 people from Fort McMurray, Alberta, 2016. International support was received for this event with firefighters from the U.S, Mexico and South Africa assisting.
- d) Severe hail and rain led to the flooding of basements and led to the evacuation of the West Edmonton Mall in 2004

Q22) In the All hazards emergency management approach, which of the following is FALSE:

- a) this approach can only be used to address natural disaster related issues
- b) this approach emphasizes leveraging common capabilities across the entire emergency management system
- c) this approach does not literally mean, preparing to address any and all potential hazards in existence
- d) this approach improves the ability to address unknown hazards or risks

Q23) which topographic feature is formed when the seafloor is spreading?

- a) continental shelf
- b) mid-ocean ridge
- c) oceanic trench
- d) underwater mountain belt

Q24) During an earthquake, seismic waves are generated. Identify the TRUE statement

- a) 3 types of waves are generated
- b) surface waves are the fastest
- c) The P wave travels at constant speed through all materials
- d) The P and S waves from 3 seismograph stations are used to determine the epicenter

Q25) At the earthquakes Canada website go to "Stations and Data" (left column) and open the "How we record earthquakes " document. Identify the FALSE statement

- a) to completely characterize the Earth's movement, the motion must be measured in 3 perpendicular directions
- b) Modern day seismometers work electromagnetically with a mass suspended on springs
- c) Earthquakes waves decrease in strength as they travel through the earth
- d) Traditional seismographs consisted of a sensing element, called a seismometer, an amplifier, and a hardcopy display unit often using photographic or heat-sensitive paper

Q26) At the earthquake Canada website go to “Products/ Research (left column) and review the seismographs in Canada publication Identify the FALSE statement.

- a) Seismometers convert ground motion vibrations into an electrical signal that in turn is converted into a digital signal.
- b) to record clear earthquake signals, seismometers are often installed on solid rock, far away from sources of noise such as trucks, trains and pounding surf
- c) there are 200 seismographs continuously recording local and global earthquakes all of which are operated by the NRC
- d) there are no seismographs in operation by the NRC in Saskatchewan.

Q27) Regarding intensity and magnitude of an earthquake. Identify the FALSE statement

- a) intensity measures the effects of an earthquake on people and infrastructure
- b) A shakemap is used to map intensity
- c) Magnitude is the amount of destruction released in an earthquake
- d) The mercalli intensity scale is a descriptive and subjective scheme based on eyewitness accounts and damage to infrastructure.

Q28) The department of public safety operates the “Get prepared” website which provides useful tips to the public on how to prepare for a natural disaster. We will explore this information.

- a) buildings do not automatically collapse in earthquakes
- b) if you are close to the source of a small/moderate earthquake, you may hear a bang followed by shaking
- c) windows may break during a large earthquake
- d) in a high-rise apartment the floors on the bottom will sway side to side during a large earthquake

Q29) At the get prepared website, go to “hazards and emergencies”, “hazards”, “earthquakes” and “What to do. During an earthquake”. Identify the FALSE statement

- a) During an earthquake, you should drop under heavy furniture or under a doorway
- b) stay inside if you are indoors and stay outside if you are outdoors
- c) if you are in a car, do not get out if downed power lines lay on top of the car
- d) during an earthquake, stay away from windows

Q30) You work for a condo developer and wish to build your next condo in the city with the lowest seismic hazard. Given the options below, you choose

- a) Victoria, BC
- b) Montreal, QC
- c) Regina, SK

d) Halifax, NB

Quiz 2:

1. You are in a helicopter following a tsunami. You measure the time between successive waves to be 100s. The frequency of the tsunami is 100s.

- a) True
- b) False

2. Tsunami waves can have a velocity similar to the cruising speed of a jumbo jet

- a) True
- b) False

3. The National Oceanic and Atmospheric Administration (NOAA) is the US agency responsible for monitoring the conditions of oceans, waterways, and the atmosphere. The following webpage is operated by NOAA and tracks tsunamis in the Pacific Ocean. The website lists Tsunami Messages for All Regions for the past 30 days. Select the HTML announcement for Kilauea Volcano on 14 July 2018 05:12.

An earthquake of a magnitude of 5.2 was observed. A tsunami warning was issued.

- a) True
- b) False

4. Go to the Pacific Tsunami Warning Centre website. Go to FAQ (left) webpage. The frequency of a major tsunami is 1 every 10 years.

- a) True
- b) False

5. The Department of Public Safety operates the "Get Prepared" website which provides useful tips to the public on how to prepare for a natural disaster. We will explore this information. A tsunami can occur in large lakes but with a big warning,

- a) True
- b) False

6. Shield volcanoes are smaller than lava plateaus

- a) True
- b) False

7. An increase in pressure is the most important mechanism to cause solid rock to melt into magma.

- a) True
- b) False

8. The Cascade Range of volcanoes of Northwestern North America is part of a chain of subduction zone volcanoes.

- a) True

b) False

9. Mt. Baker is considered a formant volcano since the ash explosions were in the 1840s.

a) True

b) False

10. In the textbook, go to Chapter 6 > (p190). Regarding volcanic causes of death, the top 3 direct causes of deaths are pyroclastic flows, tsunami, and lahar.

a) True

b) False

11. In the textbook, go to Chapter 6 > Section Canada's Sleeping Volcanoes > Garibaldi Volcano, Southern British Columbia (p181).

Garibaldi volcano is a stratovolcano that has been damaged and rebuilt several times in a succession of violent eruptions..

a) True

b) False

12. The USGS is an agency responsible for providing science on natural hazards in the US. The USGS Volcanic hazards program website provides information on volcano monitoring, news and safety.

Go to the USGS website and navigate to "Prepare" (top right) and "During an Eruption" (left).

If you are near or downwind of a volcano during an eruption, you should not drive unless absolutely necessary.

a) True

b) False

13. In the USGS Volcanic hazards program website, go to "Volcano Updates" "Alert-level system.

Notifications are issued through 10 regional US Volcano observatories.

a) True

b) False

14. In the textbook, review the in Greater depth > Volcanic ash: challenge to air traffic safety (p/186).

Ash can melt and later solidify on turbine blades, causing the engine to stall.

a) True

b) False

15. In Lake Nyos, Cameroon a successful solution to reduce the CO2 hazard has been installed vertical pipes to bring the CO2 to the surface.

a) True

b) False

16. Go to the Pacific tsunami warning centre website. Go to FAQ and Identify the FALSE statement.

- a) The wave looks and acts like giant river of water on top of the ocean that floods the shore.
- b) Seismic waves travel about 100 times faster than tsunami waves. This means, we can detect and study the earthquake much more quickly than the tsunami itself.
- c) A tsunami advisory is issued when there is an earthquake of any kind on the coast.
- d) A boat at sea should stay at sea until the harbor authority says it is safe to return.

17. Regarding tsunamis and Canada, identify the FALSE statement.

- a) The most frequent source of tsunami in BC is from Alaska.
- b) The 1929 Grand Banks earthquake event, that triggered the tsunami, caused major damage before the tsunami reached land
- c) The 1700 Cascadia earthquake and tsunami is known through oral history and is known to have destroyed a coastal village on Vancouver Island.
- d) A tsunami generated from an earthquake in the Cascadia subduction zone would strike within minutes.

18. In the textbook, go to Chapter 7 Tsunamis > Section Wind-caused Waves versus Tsunami Waves (p213). Identify the FALSE statement.

- a) Tsunami waves have less momentum than wind-caused waves.
- b) In the open ocean, wind-caused waves are generally taller than tsunami waves.
- c) Wind-caused waves are different than tsunami waves in that each wave can be considered a solitary unit.
- d) A knee high tsunami can kill you

19. You decide you want to observe active volcanic activity. The safest volcano to observe would be located in

- a) Kilimanjaro, Tanzania
- b) Iceland
- c) Tambora Indonesia.
- d) Mount St. Helens

20. The above figure was taken at the Kilauea volcano, Hawaii. What type of lava flow is shown in Figure?

- a) Aa.
- b) Lava exhibiting columnar jointing.

- c) Pahoehoe.
- d) Pillow lava.

21. Regarding viscosity and volcanic eruptions. Identify the FALSE statement.

- a. High viscosity magma have explosive eruptions.
- b. Temperature is one of the factors that control viscosity.
- c. High viscosity magma traps volatiles.
- d. A high viscosity magma has lower SiO₂ content.

22. Regarding volcanic materials, identify the FALSE statement:

- a. A lava flow with low % of volatiles that cools quickly creates obsidian.
- b. A lava flow with low viscosity that cools quickly creates a pahoehoe texture.
- c. A lava flow with high viscosity that cools slowly creates an Aa texture.
- d. Pillow lava is created when the cooling is underwater.

23. In the textbook, go to Chapter 5 Volcanic Eruptions and Landforms, Section "The Three Vs of Volcanology" (p156).
Table 5.5 and 5.6 relate the magma characteristics and the 3 Vs. Review these tables and the associated text.
Strombolian eruption style is NOT characterized by:

- a) The presence of andesite.
- b) A 5km eruption column.
- c) 3477 eruptions in the past 10 000 years.
- d) A 13 hour continuous blast.

24. In the textbook, go to Chapter 5 Volcanic Eruptions and Landforms, Section "The Three V's of Volcanology" (p156). Tables 5.5, 5.6, 5.7, 5.8 relate the magma characteristics, 3 V's, volcanic explosively index (VEI), and frequency/energy release of volcanic eruptions.
Review these tables and the associated text.
For an event with a medium volatile content, identify the FALSE statement.

- a) The volcanic landform could be a stratovolcano.
- b) The volume of ejecta could be 10⁷ to 10⁸ m³.
- c) The duration of the continuous blast can be in the range of 6 to 12 hours.
- d) For this volcano, the eruption frequency could be 39 eruptions every 10 000 years.

25. The figure shows a

- a) Stratovolcano

- b) Caldera
- c) shield volcano
- d) lava dome

26. Go to the Get Prepared, Government of Canada, website and navigate to “Tsunami” and review the links “What to do”, “Before...” & “During...”. Identify the **TRUE** statement.

- a) A tsunami may be hit shorelines if the earthquake shaking lasts more than ten seconds.
- b) Leave your gas line ON, you may need to use the gas for heat or for cooking.
- c) If you hear a tsunami warning, you should move to lower ground.
- d) If you cannot get to higher ground, stay inside where you are protected from the water.

27. Natural Resources Canada (NRC) provides information on volcanic hazards in Canada. Go to the “What are the hazards from volcanoes” link.

Identify the **FALSE** statement:

- a) Phreatic explosions are explosions caused by the interaction of water with hot rock or magma (lava).
- b) A volcanic landslide into large bodies of water can generate a tsunami.
- c) Jokulhlaups are large abrupt floods of water that may be triggered by volcano eruptions that are under a glacier.
- d) Volcanic ash is tephra smaller than 4 mm (and may be as small as thousandths of a millimetre).

28. Go to the “What are the special hazards from volcanic ash?” link.

Identify the **FALSE** statement

- a) Ash from the 1980 Mount St. Helens caused complete darkness in a city 400 km away from the volcano.
- b) During a large explosion, air travel disruptions would be likely, even in areas where no ash was deposited.
- c) Volcanic ash is similar to the ash produced by burning wood (hard, abrasive, corrosive, electrically charged, and in water)
- d) The Interagency Volcanic Event Notification Plan (IVENP) ensures rapid and effective communication of information to the aviation community.

29. Go to the “Where are Canada's volcanoes?” link.

Identify the **FALSE** statement:

a) Ash from Mount Meager of southwest British Columbia was found in Saskatchewan

b) Canada has 5 potential active volcanic areas.

c) Even though a volcano has not erupted explosively for a millennia, there is still potential for future eruptions.

d) The glass shards from an eruption at Mount Churchill were found in Newfoundland, Ireland and northern Europe.

30. In the USGS Volcano hazards program website.

Identify the **FALSE** statement

a) In the “Hazards / Ash” section: Ash fallout can impact power supply and communications equipment.

b) In the “Monitoring / Gas & Water” section: Volcanic gas and water are sampled and measured both when volcanoes are erupting and when they are quiet.

c) In the “Education” section: the opportunity to observe and learn is rare for the Hawaiian and Alaskan volcanoes.

d) In the “Preparedness / During an Eruption” section: if you are near or downwind of a volcano during an eruption, you should not drive unless absolutely necessary.

QUIZ 3:

1. The internal geomagnetic field is generated by the movement of liquid iron in the Earth's outer core
a) True
b) False
2. In the textbook, go to Ch.14 (middle of pg. 511). In August 1989, the Toronto Stock Exchange halted trading for about 24 hours when particles disrupted the charge on a few microchips
a) True
b) False
3. In the Textbook, Ch.14 (top of pg.511). In 1660, the sun had an usually high number of sunspots.
a) True
b) False
4. The planetary and Space science centre (PASSC) is a Canadian research facility affiliated with the University of NB. The facility researches impact cratering on Earth and maintains an Earth impact database. Find the Montagnais impact crater located in Nova Scotia, Canada. You may search for this crater via the map or by the list.

The Montagnais crater is exposed at the surface

- a) True
b) False
5. In the textbook, go to Chapter 14 Hazards from Space > L06 Earth's Magnetic Field (p513, navigating by page number may not work). Review In Greater Depth: Earth's Magnetic Field in the text (p422). During a reversal, the magnetic field strength is reduced to about 10% of normal.
a) True
b) False
6. Meteoroids are classified according to their source, regardless of their size,
a) True
b) False
7. Go to planetary and space science centre Earth impact database. The Houghton impact crater is the Northern most impact crater in Canada. It is located in the NWT, has a diameter of 23km and is 39Ma.
a) True
b) False

8. The Eau Claire crater is known as a double-impact site where two bodies closely bound by gravity impacted the Earth. The impact sites are circular with islands now forming in the crater from central uplift

- a) True
- b) False

9. Craters are not found in the Rockies because this region has high geomagnetism that shields the region.

- a) True
- b) False

10. Natural Resources Canada is responsible for monitoring space weather in Canada. Go to the Table of Contents > Geomagnetic storms. There are three zones of geomagnetic activity in Canada. The highest geomagnetic activity and greatest disturbances are observed in the auroral zone.

- a) True
- b) False

11. The University of Purdue maintains an impact simulator where a user can specify the properties of an impactor and see the effects when it hits the earth. You can also simulate historical impact events. On the Impact Earth website, we will simulate the impact of asteroid 2012 DA14. This asteroid is approximately half the size of a football field and flew extremely close to the Earth in February 2013.

On the Impact Earth website, set the following asteroid properties: diameter = 30 m; density = 3000 kg/m³; impact velocity = 20 km/s, impact angle = 45 degrees. Assume it hits sedimentary rock and you are 100km away.

From the results, the energy of the asteroid before entry was 2.03 MegaTons (TNT), the projectile would break up and no crater would be formed, and the air blast would hit you after 5.11 minutes

- a) True
- b) False

12. A mass movement can occur in all 3 types of rocks but most often in sedimentary

- a) True
- b) False

13. As the coefficient of friction increases, the stability of a rock material becomes less stable and more prone to movement

- a) True
- b) False

14. In the textbook, go to Chapter 13 Mass Movements and Snow Avalanches (p418).

Closure of the Trans-Canada Highway through mountain passes results in economic losses of \$2 Million per hour.

- a) True
- b) False

15. In the textbook, go to Chapter 13 Mass Movements and Snow Avalanches > Snow Avalanches > In Greater Depth: The Sea to Sky Corridor (p463)

On average, Highway 99 is closed once a year when heavy rain near the mountain summits runs off into torrents carrying a heavy load of detritus and sediment.

- a) True
- b) False

16. Go to the Space weather website. Identify the FALSE statement:

- a) It can take 1-3 days for particles ejected from a storm to reach the Earth.
- b) A reversal of the magnetic field takes a few thousand years to complete.
- c) We are able to detect solar storms quickly. Within the range of minutes to hours.

d) Space weather cannot result in a loss of cable television service.

17. Go to the Space weather website. Identify the FALSE statement:

- a) Aurora borealis and aurora australis occurs when mass ejections from the sun get trapped by the Earth's magnetic field.
- b) The X-rays and gamma rays reach the Earth in about 8-minutes.
- c) Disturbances in the ionosphere can decrease the precision of locations determined by GPS.

d) The strength of the geomagnetic storm is dependent on the size of the coronal mass ejection only.

18. In the textbook. Ch 14 (pg. 513. Identify the FALSE statement:

- a) During a reversal of the Earth's magnetic field, magnetic lines of force become twisted and tangled. Super computers identify multiple "north" and "south" poles when simulating this event.

b) In the Earth's magnetic field, the magnetic lines of force are perpendicular at the magnetic equator and parallel at the magnetic poles.

- c) Magnetism in rock is destroyed at temperatures above 550C.
- d) The magnetic pole and the rotational pole do not coincide.

19. Craters are often found by aerial photos. But gravity surveys are also quite valuable. Which of the following statements regarding gravity surveys is FALSE?

- a) Gravity data can be used to reconstruct the terrain at the time of the impact.
 - b) High gravity readings correlate to denser rock.
 - c) Impact craters typically correspond to high gravity anomalies.
 - d) A gravity survey can still be detect a crater underneath a lake.
20. The Holleford crater located in Holleford, ON has a diameter of 2.35 km. Based on the crater diameter, what is the impactor diameter?
- a) approximately 118 metres
 - b) approximately 1.2 kilometres
 - c) approximately 4.7 kilometres
 - d) approximately 47 kilometres
21. Go to the impact earth website. We will simulate the famous Chicxulub impact event associated with the extinction of the dinosaurs. Go to Famous craters > select calculate impact effects for the Chicxulub, Mexico meteorite. Assume you are 300 km away. Identify the FALSE statement:
- a) Up to 90% of the trees will be blown down and the remainder stripped of branches and leaves.
 - b) The ejecta consists only of fine dust.
 - c) A tsunami is generated with an amplitude between 27.2m and 54.4m.
 - d) The largest earthquake in recorded history would be observed.
22. Canada's largest and oldest impact crater in Sudbury, Ontario exhibits an elliptical structure rather than a circular one. The reason for this is that:
- a) The impact angle was almost parallel to the Earth's surface, resulting in the meteor dragging along the ground.
 - b) It was originally circular, but was deformed by regional fault motion.
 - c) The meteor had an elliptical cross-section.
 - d) Erosion has distorted its shape over the last billion years.
23. In the textbook, Ch. 14 (top of pg. 500). Identify the FALSE statement:
- a) The amount of iridium in the clay layer at the K/Pg boundary is 300 times greater than normal abundance.
 - b) The impact structure was measured by gravity measurements and found to have a raised inner ring 80 km in diameter and an outer ring about 195 km in diameter.
 - c) Quartz grains at the K/Pg boundary show shocked crystal structures, indicating a short and violent impact. Shocked quartz has been found only in association with impacts.
 - d) Following the impact of the K/Pg asteroid, wintry conditions would have been present for several months as the airborne dust and soot blocked much incoming sunlight followed by a greenhouse warming effect for several years.

24. The type of pattern illustrated in the above figure is:

Select one:

- a) Shock wave
- b) Cross-hatch pattern**
- c) Shattercones
- d) Micro-fault

25. Identify the FALSE statement:

Select one:

- a) An asteroid is an impactor larger than 100 m in diameter
- b) A shooting star of 1m diameter has a return period of 1 year.**
- c) From 1900 to 2013, the top ten closest observed asteroid encounters are all Apollo type except for one Aten type asteroid.
- d) An asteroid associated with the K/Pg boundary has an average return period of 100, 000, 000 years.

26. In the textbook. Ch.13 (p.431), Identify the FALSE statement:

Select one:

- a) Following the 1841 rockfall, the federal government bought and demolished several houses.
- b) In 1889, after 12 hours of rain, a major rockfall occurred metres from the 1841 site.
- c) A publication by M.C. Baillarge in 1893, is still referenced today.
- d) Today, it is the responsibility of Quebec City to ensure the proper mitigation measures are taken. They spend as much as \$80 000 on each house.**

27. Certain regions are prone to landslides to the extent that the government will provide home owners guides. Review the information provided in this guide. Identify the FALSE statement:

Select one:

- a) 1 cubic foot of water weighs 62.3 lbs. The added weight increases the downward force on a slope.
- b) A few inches of slope movement can destroy a home.
- c) A living tree has roots that strengthen slopes. Even after cut, the roots can maintain their strength over 8 years.**
- d) Uneven terrain, cracks in the soil, and leaking or broken pipes are a sign of landslide activity.

28. Review the Home owners guide to landslides.

You are visiting a friend who owns a cottage in Washington state. During your visit, you notice an issue with respect to landslides and warn your friend. The warning is with respect to:

Select one:

- a) Your friend has native plants (shrubs and groundcover) on slopes.

- b) Your friend is routing rain water towards steep slopes.
- c) Your friend has a driveway on a mild slope.
- d) Your friend has placed soil on flat ground beside his house.

29. Review the Home Owners Guide to landslides

You are visiting a friend who owns a cottage in Washington. During your visit you notice an issue in their cottage with respect to landslides. Your warning is:

Select one:

- a) You notice a light switch does not work.
- b) You notice dry, worn down beams.
- c) You notice paint peeling in the upstairs ceiling.
- d) You notice water damage in the basement walls.

30. In the textbook, go to Ch 13 Mass movements and Snow Avalanches.

Identify the FALSE statement:

Select one:

- a) Go to Section "Classification of Mass Movements" (top of p428) and review Figure 13.12. A mudflow occurs in dry soil and occurs rapidly (meters / minute)
- b) Go to Section "Slides" and review Figure 13.23. A few homes slid during the Saint-Jean-Vianney lateral spread and a few of them remained structurally intact.
- c) Go to Section "Complex Events" and review the 1903 Frank Slide, Alberta event (top of p443). The rock slide is not considered as due to a single cause.
- d) Go to Section "Subsidence" (p447). Dissolution is responsible for the honeycomb texture in the Palisser formation at Canmore, Alberta.

Quiz 4:

Q1) In particularly active rock fall areas, large block walls are used to reinforce the hazard.

- a) True
- b) False**

Q2) An earth flow can occur after heavy rain and snowmelt

- a) True**
- b) False

Q3) Avalanches are ranked based on their size in a linear manner

- a) True
- b) False**

Q4) The Avalanche Canada is a non-government, not-for-profit organization dedicated to public avalanches safety. The website provides excellent information to public such as an avalanches map and advice for both skiers and snowmobiles. Navigate to “backcountry resources Essential Gear”

You plan to do some backcountry snowboarding. You through you’re your backpack a 320 cm probe and a metal shovel. You keep the avalanche transceiver with your cell phone in your breast pocket.

True or False: You will be snowboarding in the safest way possible

- a) True
- b) False

Q5) On Avalanche Canada website, navigate to “snowmobiles: Avalanche basics”

You are in a pack of snowmobilers and your friend gets stuck in an avalanche run out zone. They are waiving at you to come and help them.

True or False: with respect to avalanche safety you should stay put.

- a) True**
- b) False

Q6) Hailstones grow in size and mass as they fall toward the ground

- a) True
- b) False**

Q7) The department of public safety operates the “Get prepared” website which provides useful tips to the public on how to prepare for a natural disaster, we will explore this information

Go to the “Floods” page.

If flooding is imminent, move furniture, electrical appliances to floors that are above ground.

- a) True
- b) False

Q8) Go to the "Tornado" page. On August 1, 2018 at around 05:40PM, Environment Canada issued a tornado warning for the City of Ottawa.

If you were caught in this tornado, you should take shelter in a small interior ground floor room or the basement.

- a) True
- b) False

Q9) Lightning bolts can travel from a cloud to an adjacent cloud

- a) True
- b) False

Q10) Increasing the amount of precipitation increases the amount of infiltration

- a) True
- b) False

Q11) The Canadian gov has a department, Enviro and Climate change Canada, whose mandate is related to a wide range of enviro issues. Here, we examine the information posted on their Seasonal weather hazards site. In 2005, a rainstorm in Toronto saw up to 250 mm of rain in less than 2 hours. The estimated cost of this event was over \$500M.

- a) True
- b) False

Q12) Enviro Canada maintains a website on seasonal weather hazards. We will examine the information on the website. You see a tornado that does not appear to be moving, it is likely either moving straight away or straight towards you.

- a) True
- b) False

Q13) Downcutting increases flow velocity by decreasing the gradient of the stream

- a) True
- b) False

Q14) The above photo was taken in February 2018 in Grand River in Brantford ON. The photo shows a rain-on-ice backup flood.

- a) True
- b) False

Q15) The equation for discharge is: $Q = A \cdot v$

- a) True
- b) False

Q16) In the textbook, go to Ch.13 Mass movement In Greater Depth (pg.463). Identify the FALSE statement:

- a) There have been no landside-related casualties since the early 1980s along this highway.
- b) This highway was once nicknamed the “sea-to-die” highway.
- c) There is a low frequency of debris flow at Brunswick Point and Snake Hill.
- d) Travelling along the Highway 99 is like getting a practical course in civil engineering.

Q17) You are responsible for providing an avalanche bulletin to travellers. For the area you are responsible for, you have determined that the potential for natural avalanches are possible and humans should be more cautious in steeper terrain. What rating on the international Avalanche scale to do you apply?

- a) Low
- b) Moderate
- c) Considerable
- d) high

Q18) In the textbook Ch.13 Mass movement > Human Focus: Jim Bay. Identify the FALSE statement:

- a) Jim Bay is fascinated by this discipline because he grew up in Revelstoke, B.C., which is known for dangerous avalanches.
- b) Gas exploders are a new tool that are permanently fixed high on the slopes to prevent unsafe buildups of snow.
- c) If an avalanche occurs, it is best to try to outrun it.
- d) Jim Bay is an expert in reading the snow, he is aware of subtle temperature changes, and understands how snow and wind interact to load a slope.

Q19) In the textbook, go to Chapter 13 Mass Movement... > Section Snow Avalanches (top of p452). Identify the **FALSE** statement

- a) A snowpack is commonly warmer than the surrounding air and ground, which causes the snow crystals within the snowpack to transform.
- b) Several roads and highways in the Rockies feature “no stop” zones in known avalanche areas.

- c) A Size 4 Avalanche will have a mass of 10000 tonnes and will be able to destroy a railway car.
- d) The best mitigation strategy in the back country is avoidance.

Q20) In 2016, the CBC conducted an analysis of avalanche death rates. We will examine this article.

- a) Out of bounds skiing
- b) Back country skiing
- c) Snowmobiling
- d) Mechanized skiing

From the “CBC Analysis” > “Avalanche death rates on the decline as Canadians develop greater 'respect' for mountains” article

The activity with the highest proportion of avalanche fatalities for 2011-2012 is:

Q21) From the CBE Analysis> Avalanche death rates on the decline as Canadians develop greater “respect for mountains” article, identify the FALSE statement:

- a) Since 1999, the 2008-2009 season had the second highest number of avalanche fatalities
- b) The majority of fatalities from avalanches in 2002-2003 occurred while individuals were back country skiing.
- c) From 1999-2016, the number of people doing activities in avalanche prone areas has decreased substantially.
- d) Experienced skiers and mountaineers feel they have more control over risks in the backcountry than driving on the highway.

Q22) Wit respect to the diagram above, which of the following statements is FALSE?

- a) the sinuosity is lower in A
- b) the flow speed is lower in A
- c) the gradient is not equal in both streams
- d) the distance traveled by the water is greater in B

Q23) Which sketch in the figure shows how the winds will deflect by the Coriolis effect in the Northern Hemisphere

- a) Sketch A
- b) Sketch B
- c) Sketch C
- d) Sketch D

Q24) The rupture surface of a rotational slide is

- a) convex facing upwards
- b) convex facing downwards
- c) concave facing upwards
- d) concave facing downwards

Q25) what type of flow is related to melting permafrost layers in northern regions?

- a) Lateral flow
- b) Gelifluction
- c) Subsidence
- d) creep

Q26) Review from the text, go to Chapter 9 Severe Weather > Section Thunderstorms > What to Do and Not to Do in Case of Lightning (p298). Identify the **FALSE** statement.

- a) crouch and ball up, do not lie flat, and move to a low place
- b) stay 5 m apart from each other if you are outside with others
- c) do not touch a land-line based phone
- d) if you're inside, stay by the window to monitor the storm

Q27) In the textbook go to page 369 and Identify the FALSE statement:

- a) After a flood, be wary when entering a house as there is a potential electrical hazard
- b) The radial gates of the London flood barrier are lowered into the water to disrupt the water flow
- c) Humans try to control flood waters by making channels. In several cities, rivers have their flood lined with concrete
- d) Levees are prone to subsurface erosion

Q28) In Greg Brooks lecture on the Saguenay. Identify the False statement:

- a) The source of the Sables and Chicoutimi river is lake Kenogami
- b) During the flood, 6 of 10 dams exceeded maximum operating spilling capacity
- c) The Ha! Ha! River flood was accentuated due to a dyke breach
- d) To mitigate against future floods, 65 km of floodplains were sterilized through buyouts and expropriations

Q29) Go to the spring and summer hazards website by Enviro Canada, Identify the FALSE statement:

- a) "Straight-line" winds (not tornadoes) cause most thunderstorm wind damage
- b) Most tornadoes develop in the late afternoon and early evening
- c) A humidex of 30-39 is associated with great discomfort
- d) There are 2 types of summer heavy rains

Q30) In Greg Brooks lecture on the Red River, Manitoba flood. Identify the False statement:

- a) the Red River has a low gradient (~ 7 cm per km)
- b) the 1997 Red River flood was nicknamed the Red sea
- c) some houses are built on pads to avoid floods
- d) the Red River flood characteristics are a function of local landscape including hilly landscape