

Name: ANSWERS

Student Number: _____

**YORK UNIVERSITY
FACULTY OF SCIENCE and ENGINEERING**

SC/EATS 1010 3.0

THE DYNAMIC EARTH and SPACE GEODESY

MID-TERM TEST - OCT. 18, 2012.

PART A: Multiple Choice (25 marks)

Circle the letter beside the most correct answer. Each answer is worth 1 mark.

1. An elastic material:
(a) Behaves viscously on long time scales but elastically on short time scales
==> (b) Experiences no net displacement of internal particles once a stretching force is removed
(c) Experiences no net displacement of internal particles when a deforming force is applied
(d) Experiences no displacement of internal particles within broken fragments.

2. The lava erupting at converging plate boundaries is:
(a) Basalt
==> (b) Andesite
(c) Granite
(d) Olivine.

3. The height of mid-ocean ridges is due to:
(a) The build up of basaltic volcanism
==> (b) Thermal contraction of cooling lithosphere
(c) Unknown forces
(d) Pressure release melting at the ridge crest.

4. The "Curie Temperature" is the temperature above which:
(a) Electric currents no longer produce magnetic fields
==> (b) Magnetic minerals lose their natural or permanent magnetism
(c) The Earth's magnetic field reverses
(d) Magnetic minerals first melt
(e) Crustal rocks become radioactive.

5. Continent-continent collision is immediately preceded by:
(a) Continent-ocean collision
(b) Subduction of the intervening sea-floor
(c) Andesite volcanism
==> (d) All of the above
(e) None of the above.


6. The Hawaii-Emperor seamount chain indicates:
(a) Plate motion in a constant direction over a stationary hot spot
(b) A large island arc due to ocean-ocean collision
==> (c) The Pacific plate is moving towards the Northwest at present
(d) The Pacific plate is moving NW at present but was previously moving southwards.
7. A Benioff zone is:
==> (a) Another term for a subduction zone
(b) Any linear zone of seismicity
(c) The zone of maximum bending in a sinking plate
(d) Another term for a shearing fault zone.
8. The age of the planets of the Solar System is approximately:
(a) 4.6 million years
(b) 0.6 million years
(c) 200 million years
(d) 1 Astronomical Unit
==> (e) None of the above.
9. We say that Earth is a differentiated planet because:
(a) It is different from all other planets
(b) Distinct continents and ocean basins exist
==> (c) The crustal rocks have a lower density than mantle rocks
(d) The inner core is solid while the outer core is liquid
(e) It is the only planet with surface water and life.
10. Which of the following is not normally located at a converging plate boundary:
==> (a) Mid-ocean ridge
(b) Ocean trench
(c) Island Arc
(d) Deep earthquakes
(e) All of the above.
11. Continents stand higher than ocean basins because:
(a) Continental crust is thicker than oceanic crust
(b) Continental crust has a lower density than oceanic crust
(c) Continental crust is thicker and has a higher density than oceanic crust
==> (d) Continental crust is thicker and has a lower density than oceanic crust.
12. The mass of all the planets represents what fraction of the mass of the solar system?
(a) 50%
(b) 1%
(c) 5%
==> (d) .1%
(e) None of the above.

13. With respect to the two types of elastic, or seismic, waves:
=> (a) P-waves are longitudinal with particle motions perpendicular to the direction of propagation
(b) P-waves are longitudinal with particle motions parallel to the direction of propagation
(c) S-waves are longitudinal with particle motions parallel to the direction of propagation
(d) S-waves are longitudinal with particle motions perpendicular to the direction of propagation.
14. Meteoroids are:
=> (a) chunks of space debris that fall to the Earth's surface
(b) small pieces of rock from space that burn up in the Earth's atmosphere
(c) space debris in orbit about the Sun
(d) hot enough to glow at approximately 150 km above Earth's surface
(e) called meteors or shooting stars as they pass through the atmosphere at high velocities
15. The Wilson Cycle refers to:
=> (a) recurring opening and closing of ocean basins
(b) cyclic slipping along transform faults
(c) hot spots below moving plates
(d) the expanding and contracting Earth hypothesis
(e) the rock cycle on continents.
16. All magnetic fields are produced by:
=> (a) Alternating electric currents
(b) Moving electric charges
(c) Orbiting electrons
(d) Motions of electric conductors in Earth's iron core
(e) None of the above.
17. The study of ancient magnetic fields is known as:
=> (a) Geomagnetism
(b) Electromagnetism
(c) Hydromagnetism
(d) Paleomagnetism
(e) Polar Wandering.
18. At plate boundaries where two plates diverge, we find:
=> (a) Mid-ocean ridges
(b) Basaltic island arcs on the overriding plate
(c) Deep earthquakes in the subducted plate
(d) Chains of extinct volcanoes which are youngest close to the trench
(e) All of the above.
19. The principle of continents being in a buoyant equilibrium is called:
=> (a) subsidence
(b) isostasy
(c) convection
(d) crustal rebound
(e) none of the above.

20. Lunar maria are:
(a) lunar striations from early glaciation
(b) water filled oceans distinct from the lunar highlands
==> (c) lava filled impact basins
(d) undated and unsampled dark surface areas
(e) none of the above.
21. Comets are:
==> (a) bodies of gas, ice and rock
(b) glow in the night sky due to internal fusion reactions in the small central nucleus
(c) have long tails stretching millions of AU's in length
(d) become hot enough to glow at approximately 150 km above the Earth's surface.
(e) commonly referred to as shooting stars.
22. The current magnetic epoch is referred to as:
==> (a) Brunhes
(b) Matuyama
(c) Curie
(d) Gilbert
(e) Gauss.
23. Earth's atmosphere was formed:
(a) by out gassing during volcanic eruptions
(b) during the first 1 billion years
(c) partially from water and gas in meteorites
==> (d) all of the above
(e) none of the above.
24. The distance from the Sun to the Earth is:
==> (a) 1 A.U.
(b) 1 A.M.
(c) 1 Light year
(d) 50,000 x Earth's diameter
(e) 150,000 km.
25. Wegener speculated in 1912 that all continents were once grouped together as a single continent called:
==> (a) Pangea
(b) Gondwana
(c) Laurasia
(d) Rodinia
(e) Oceana.
26. Consider a horizontal wire loop with an electric current flowing along the wire. If the current flows counter-clockwise when looked at from above, the resulting magnetic field is :
==> (a) a magnetic dipole with a north pole above the loop and a south pole below
(b) a magnetic dipole with a north pole to the right of the loop and a south pole to the left
(c) a magnetic monopole since there is just one current loop
(d) a magnetic quadrupole
(e) a magnetic dipole with a north pole below the loop and a south pole above the loop.

27. The origin of permanent magnetization in a magnetic mineral, such as magnetite, is:
- (a) the movement of negatively charged electrons orbiting about the nucleus of the atoms in the mineral
 - (b) spontaneous current flow due to free electrons in metals
 - (c) randomly oriented atomic dipoles
 - ==> (d) atomic dipoles all aligned in the same direction
 - (e) an unsolved problem in classical physics.



28. Consider the strike-slip fault shown here:  If this is a Left Lateral Fault,
- (a) the baboon and antelope must both move to the left
 - ==> (b) the baboon moves to the left and the antelope moves to the right
 - (c) the baboon moves to the right and the antelope moves to the left
 - (d) the baboon is confused by the antelope moving to the right.
 - (e) the baboon moves to the left but the baboon thinks the antelope is moving to the right.



29. The magnetic field produced by a bar magnet is a magnetic dipole, with a north pole at one end and a south pole at the other. If a bar magnet is broken into two pieces, the result is:
- (a) two magnetic monopole fields, one with a north polarity and one with a south polarity
 - (b) the magnetic field is destroyed since the dipole is the most basic magnetic structure
 - (c) two magnetic dipole fields, one produced by each of the broken parts of the bar magnet and each as strong as the original dipole field
 - (d) the alignment of atomic dipoles is disturbed and the magnetic field gradually disappears
 - ==> (e) two magnetic dipole fields, each weaker than the original dipole field.

30. Magnetic declination is:
- (a) the mean tilt angle of Earth's magnetic field relative to the Earth's rotation axis
 - (b) the angle a magnetic field line makes with the local horizontal at any point on Earth's surface
 - ==> (c) the angle of a magnetic field line relative to the direction of true, or geographic, north
 - (d) the departure of a magnetic field line in space from the direction of true north
 - (e) the angular distance on Earth's surface from the point of observation to the north magnetic pole.

**** N.B. *****

TRANSCRIBE ALL OF YOUR ANSWERS ABOVE ONTO THE COMPUTER ANSWER SHEETS - NOW.

PART B: True or False - Circle T or F (20 Marks)

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|-----|--|---|
| 31. | Fold mountains are produced by continent-continent collisions. | T |
| 32. | The lithosphere includes both the crust and the outermost cold core material. | F |
| 33. | Andesite volcanism results from pressure release melting in subduction zones. | F |
| 34. | Complex craters occur with smaller diameters on smaller planets. | F |
| 35. | The global surface distribution of Earthquakes may be characterized as long narrow bands of seismic activity surrounding large seismically active regions. | F |
| 36. | After a viscous substance is deformed, it will slowly return to its original shape if left alone long enough. | F |
| 37. | S-waves and Love waves are seismic body waves. | F |
| 38. | The average density of planet Earth is about 5.5 times the density of water. | T |
| 39. | Impact cratering was the most common type of geological activity during the first half billion years of Earth's history. | T |
| 40. | The Earth's surface is divided into about a dozen large viscous plates in relative motion. | F |
| 41. | Earth's internal heat engine is powered by heat flowing from the hot interior toward the cooler exterior. | T |
| 42. | Isotopes of an element have the same atomic number but different mass numbers. | T |
| 43. | Jovian planets are spaced twice as far apart as Terrestrial planets. | F |
| 44. | The Earth formed 4.6 billion years ago by differentiation. | F |
| 45. | Permanent magnetization in magnetic minerals such as magnetite results from the alignment of all the atomic dipoles in the same direction. | T |
| 46. | Radioactive decay by beta-particle emission refers to an electron being ejected from the nucleus of an unstable isotope. | T |
| 47. | Sediments with buried fossils, minerals and organisms occur in the worlds oceans in the amounts predicted by sedimentologists. | F |
| 48. | Saturn is about 9.5 times as far from the Sun as is the Earth. | T |

49. A guyot is a seamount that stands above sea-level. F
50. The separation of the Earth's core, mantle and crust from a uniform mixture early in the Earth's history is referred to as "accretion". F

***** NB *****

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Use Column (a) for True and Column (b) for False.

PART C: Short Answers (15 Marks) Answer in the spaces provided below.

1. Name the four Jovian Planets in order of decreasing size. Which of these has the lowest density? (5 marks)

1. _____ Jupiter _____

2. _____ Saturn _____

3. _____ Uranus _____

4. _____ Neptune _____

Lowest density: __ Saturn _____

3. How thick (to the nearest 100 km) are each of the following internal layers inside Earth? (3 marks)

1. The Lithosphere: ____ 100 km _____

2. The outer core: ____ 2300 km _____

3. The lower mantle: ____ 2200 km _____

4. List the name given to the stage of crater formation when each of the following features are created? (3 marks)

1) Rays: _____ Compression _____

2) Central Peak: __ Subsequent Modification _____

3) Ejecta Blanket: _____ Excavation _____

5. Complete the following table to show the change in atomic number and mass number for each radioactive decay process (4 marks).

<u>Process</u>	<u>Effect on Atomic Number</u>	<u>Effect on Mass Number</u>
α -particle emission	Decrease by 2	Decrease by 4
β -particle emission	Increase by 1	No change
k -capture	Decrease by 1	No change
γ -radiation	No change	No change