

## IESO 2012 Written TEST ASTRONOMY

Name \_\_\_\_\_ Nationality \_\_\_\_\_

1. The duration of spring and summer in the southern hemisphere is 178.7 days, whilst the duration of autumn and winter is 186.5 days (the opposite is valid for the northern hemisphere). This apparently strange fact is related to: (1.pt)
  - (A) The magnetic field of the Sun affects the velocity of the Earth when it approaches the perihelion
  - (B) The fact that the Earth changes its velocity in accordance to Kepler's Second Law
  - (C) The precession of the Earth
  - (D) The Earth is in its perihelion in July
2. If you were at the North Pole, Polaris would be ... (1.pt)
  - (A) at your zenith
  - (B) at your northern horizon
  - (C) below the horizon
  - (D) It depends on the time of day
3. The magnifying power of a (refracting) telescope can be calculated ...(1.pt)
  - (A) using sophisticated computer simulations
  - (B) from the focal lengths of the two lenses
  - (C) from the diameters of the two lens
  - (D) from the price of the telescope
4. For similar tidal amplitudes in different geographic locations, the surface of beach covered by the water during each tidal cycle is related to: (1.pt)
  - (A) The absolute value of low tide above mean sea level
  - (B) The slope of the beach
  - (C) The influence of local winds on the tide
  - (D) The influence of the local temperature
5. Right ascension is the sky's equivalent to the Earth's ... (1.pt)
  - (A) Latitude
  - (B) Longitude
  - (C) Altitude
  - (D) Meridian
6. Azimuth is the \_\_\_\_?(1.pt)
  - (A) angle, measured in degrees, above the nearest horizon
  - (B) horizontal direction (angle) or bearing of an object in the sky
  - (C) point in the sky (on the "celestial sphere") directly overhead
  - (D) great circle on the celestial sphere that passes through your zenith and also through both celestial poles

7. If your latitude is 30 , what is the most southerly declination of a star to be circumpolar? (2.pt)
- (A) +90
  - (B) +60
  - (C) +30
  - (D) -30
8. The amount of light that a telescope can collect is limited by the telescope's ...(1.pt)
- (A) chromatic aberration
  - (B) focal point
  - (C) aperture
  - (D) eyepiece
9. What is the correct term for the time taken for any object in the Solar System (such as the Moon) to return to the same position relative to the Sun as seen from Earth? (1.pt)
- (A) year
  - (B) solar time
  - (C) sidereal period
  - (D) synodic period
10. The color of a star is mainly due to its ...(1.pt)
- (A) surface temperature
  - (B) composition
  - (C) distance
  - (D) twinkling
11. A superior planet can be seen to retrograde when it is near ...(1.pt)
- (A) conjunction
  - (B) quadrature
  - (C) opposition
  - (D) the Moon
12. When a planet is less than one astronomical unit (AU) from Earth AND shares the same AR as the Sun, that planet must be ...(1.pt)
- (A) Venus
  - (B) Mercury
  - (C) at superior conjunction
  - (D) at inferior conjunction

13. An inferior planet at its greatest eastern elongation is best seen ...(2.pt)

- (A) around midnight
- (B) around noon
- (C) just after sunset
- (D) just before sunrise

14. Two optical telescopes A & B are used to observe the same celestial object. (Assume both have the same transmission rate.)

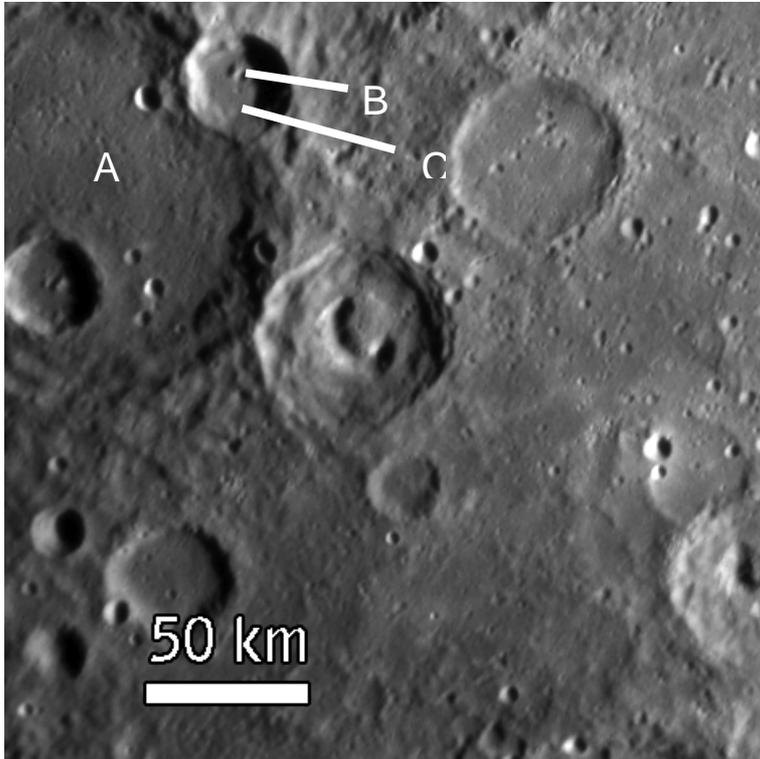
telescope	A	B
diameter	25 cm	100 cm

To obtain the same number of photons, what would be the exposure of telescope A to have the same amount of photons obtained by telescope B? (2.pt)

- (A) 4 times
  - (B) 8 times
  - (C) 16 times
  - (D) 32 times
15. The star Alpha Centauri is approximately  $4.0 \times 10^{13}$  km away from Earth. If Alpha Centauri moves closer like the Moon (about  $4.0 \times 10^5$  km away), about how much brighter is Alpha Centauri than before? (2.pt)
- (A)  $10^8$  times
  - (B)  $10^{12}$  times
  - (C)  $10^{16}$  times
  - (D)  $10^{24}$  times
16. If the Sun set below your western horizon about 6 hours ago, and the Moon is barely visible on the eastern horizon. Which phase of the Moon would this be? (2.pt)
- (A) Full Moon
  - (B) First Quarter
  - (C) New Moon
  - (D) Third Quarter
17. If we have our own aircraft and want to fly directly from Albany, Australia ( $35^{\circ}1'$  South,  $117^{\circ}53'$  East) to Olavarria ( $36^{\circ}52'$  South,  $60^{\circ}5'$  West), with shortest distance, we will pass through the following region: (2.pt)
- (A) Antarctic
  - (B) South Africa
  - (C) Hawaii
  - (D) New Zealand

18. Dating impact craters

From time to time, the planets are struck by bodies coming from the space. The impact of these bodies on Mercury's surface results in circular structures known as an impact craters. The superimposing relationships between craters provide a useful tool for relative dating of these structures. Please carefully analyze the photo below. Which of the options below is the correct sequence from oldest to youngest? : (2.pt)



- (A) A - B - C
- (B) A - C - B
- (C) B - A - C
- (D) B - C - A

**IESO 2012 Written TEST Atmosphere**

Name \_\_\_\_\_ Nationality \_\_\_\_\_

1) . Look at this picture below and indicate the correct answer: (1 pts)

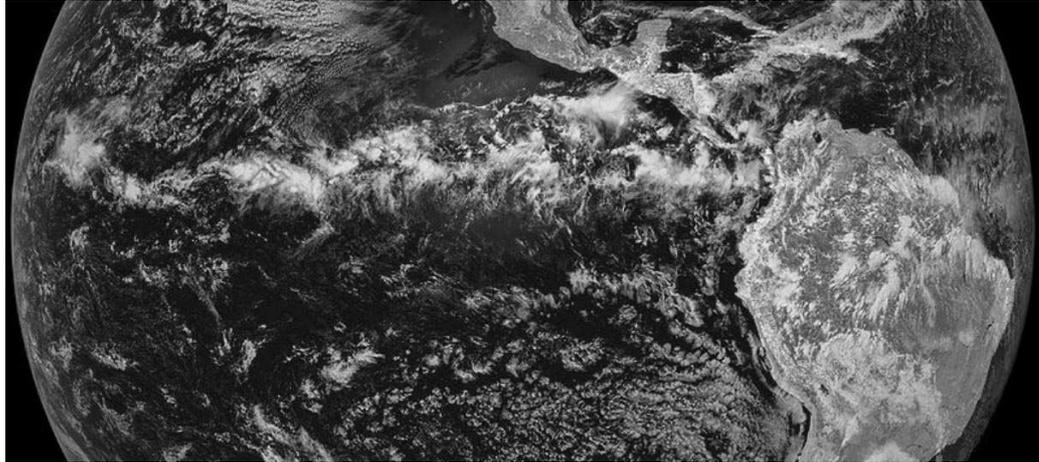


Figure 1. Satellite image of Tropics area

This belt of clouds forms on the equator, where cold air from the northern hemisphere meets warm air from the southern hemisphere.	<b>A</b>
During the summer of the northern hemisphere, the mean position of this belt of clouds is north of the equator.	<b>B</b>
This belt of clouds is associated with high pressures.	<b>C</b>
This belt of clouds forms at the confluence of winds named “westerlies”.	<b>D</b>
This belt of clouds forms where cold air from the upper atmosphere comes down.	<b>E</b>

2). What is the <b>INCORRECT</b> statement about the jet stream? (1 pt)	A sharp variation of the height of the tropopause gives information about the position of the jet stream	<b>A</b>
	The presence of dark stripes visible in a water vapour image gives information about the position of the jet stream	<b>B</b>
	The jet stream has a maximum velocity called the jet stream core	<b>C</b>
	On a 300 hPa chart the position of the jet stream is not able to be identified	<b>D</b>

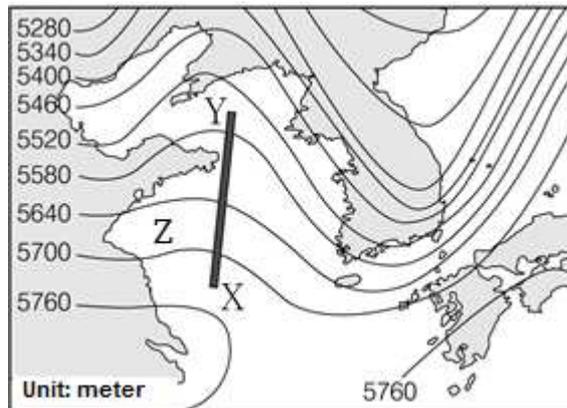


Figure 2. Geopotential contours

.3). Figure 2 above illustrates the distribution of the geopotential contour of the 500 hPa isobaric surface over Korea. (1 pt)

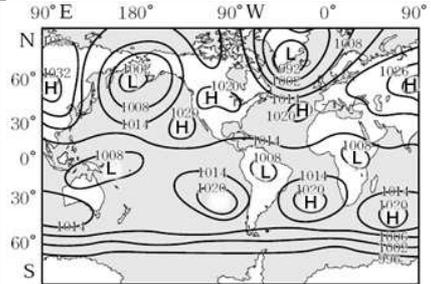
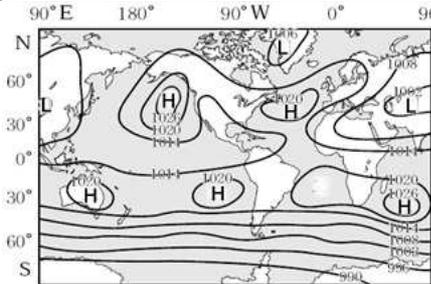
Select the best answer among the statements that describes the upper air correctly

1. Pressure gradient forces act from point X towards point Y.
2. At point Z the wind blows from the west to the east.
3. The steeper the slope of the 500hPa isobaric surface the greater the pressure gradient force

1	A
2	B
3	C
2 and 3	D
1 and 2	E
1 and 3	F
1,2, and 3	G

4). The western coast of the southernmost part of South America, to the west of the Andes, is characterized by the presence of a rain forest. As opposed to the area to the east of the mountain chain which is a desert (the Patagonia). Taking into account that winds in the area blow most of the time from west to east, how you could explain this difference in vegetation? (1 pt)	In the Andes there are many volcanoes that produce a lot of ash that facilitates precipitation.	<b>A</b>
	The rainfall mainly resulted from mountain effect – “orographic uplift”	<b>B</b>
	Seasonal Monsoonal rainfall	<b>C</b>
	Increased in water flow due to the melting of glaciers	<b>D</b>

5). Choose the correct statement about the atmosphere near the equator (1 pt) :	
(A) Cold and warm fronts are the dominant source of rainfall	<b>A</b>
(B) Diurnal variation is not important	<b>B</b>
(C) Typhoons often develop in this area	<b>C</b>
(D) The Tropopause temperature is colder than that of midlatitude regions	<b>D</b>
(E) The pressure gradient is important for weather analysis	<b>E</b>

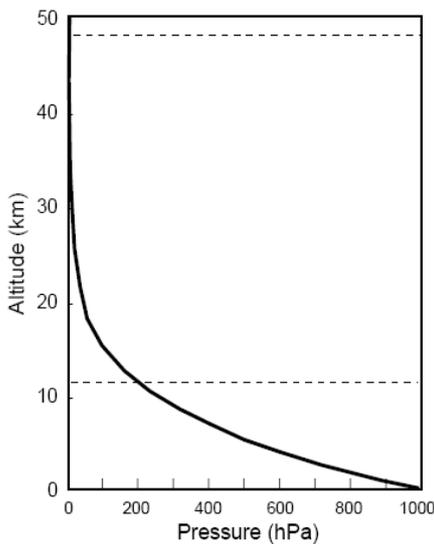
 <p>Figure 3a January</p>	 <p>Figure 3b July</p>		
		1	<b>A</b>
		2	<b>B</b>
		3	<b>C</b>
		2 and 3	<b>D</b>

6). Figures 3a and 3b above illustrates the distribution of annual average atmospheric pressure on the ground in January and July. Select the best response from the following statements to describe the given weather charts correctly. (1 pt)		
1. In the northern hemisphere Winter, high pressure develops over the land area.	1 and 2	<b>E</b>
2. In January, high pressure develops over the land area in the southern hemisphere.	1 and 3	<b>F</b>
3. There is less average variation in atmospheric pressure between winter and summer in the northern hemisphere, compared with the southern hemisphere.	1,2, and 3	<b>G</b>

7). Match the following statements with the right choices (1pt)	Put the letter of your choice below	
1. Which gas has the biggest variation in space and time, and has strong influence on the local weather?		A. CO <sub>2</sub>
2. Which gas has the highest concentration in the Earth's atmosphere?		B. CO
3. Which gas makes the largest contribution to the greenhouse effect?		C. H <sub>2</sub> O
4. Which gas's anthropogenic concentration change is contributing most to climate change?		D. He
		E. N <sub>2</sub>

8). Clouds are classified according to height and form. Which response best describes Altocumulus lenticularis? (1 pt)	High cloud	A
	Middle cloud	B
	Low cloud	C
	Stratiform cloud	D
	Cirriform cloud	E

Figure 4



Question number 9 and 10 refers to Figure 4 to the left.

Figure 4 shows the vertical profile of mean global air pressure starting from mean sea level and going up to 50 km in altitude. Use the information from Figure 4 to answer the following questions:

9). The term "Pressure" at the horizontal axis is equivalent to ..... (1 pt)	Weight divided by Volume	A
	Mass divided by Area	B
	Density multiplied by Temperature	C
	Mass multiplied by Temperature	D
	Force divided by Area	E

10). According to Figure 4, The thickest layer is ..... (1 pt)	101-110 hPa	A
	501-510 hPa	B
	701-710 hPa	C
	1001-1010 hPa	D

11). Choose the correct answer (1 pt)		
1. Wind above the 1 km elevation generally blows parallel to the pressure contour lines. 2. It always rains when a warm front is approaching. 3. Behind the cold front a northwest wind will blow. A southeast winds will blow behind a warm front. 4. The fronts are expected to move towards the north. 5. The speed of the cold front is nearly the same as the wind speed just behind front.	1 and 2 are true	A
	2 and 4 are true	B
	1 and 3 are true	C
	1 and 4 are true	D
	1 and 5 are true	E
	3 and 5 are true	F
	4 and 5 are true	G
3 and 4 are true	H	

12). The center of mass of the Earth's atmosphere is (1pt):
A) a little less than halfway between the Earth's surface and the outer boundary of the atmosphere. B) near the surface of the Earth. C) near the outer boundary of the atmosphere. D) <b>near the center of Earth.</b> E) none of the above.

13). Look at the picture of the clouds in Figure 5 below	Figure 5
Which statement is correct ? (1pt) The clouds are: (A) associated with a vertical wind shear (B) formed due to a passage of a jet plane (jet contrail) (C) thunderstorm clouds (D) a precursor of an earthquake (E) cloud street	

Calculation Problems

14).

Temperature (°C)	Vapor Pressure (X 10 <sup>3</sup> Pa)
10,0	1,23
12,0	1,40
14,0	1,60
16,0	1,81
18,0	2,06
20,0	2,34
22,0	2,65
24,0	2,99
26,0	3,36
28,0	3,78
30,0	4,24

The vapor pressure of water decreases as the temperature decreases. If the amount of water vapor in the air is kept constant as the air is cooled, then the temperature would reach the *dew point*, at which the partial pressure and vapor pressure coincide and the vapor is saturated.

If the air is cooled further, vapor condenses to liquid until the partial pressure again equals the vapor pressure at that temperature.

In the meteorological laboratory with the room temperature 26.0 °C, a meteorologist cools a metal can by gradually adding cold water. When the can temperature reaches 16.0°C, water droplets form on the can's outside surface.

What is the relative humidity of the 26.0°C air in the room?  
(show all your calculations) (3 pts)

**Answer.**

$$\text{Relative humidity} = \frac{\text{partial pressure of water vapor at temperature } T}{\text{saturated vapor pressure of water at temperature } T} \times 100 \%$$

The experiment shows that the dew point is 16.0°C, so the partial pressure of water vapor at 26.0°C is equal to the vapor pressure at 16.0°C, which is 1.81×10<sup>3</sup> Pa.

$$\text{Thus the relative humidity} = \frac{1.81 \times 10^3 \text{ Pa}}{3.36 \times 10^3 \text{ Pa}} \times 100\% = 0.539 \times 100\% = 53.9\%$$

15). In a static atmosphere, the pressure change with height is governed by the hydrostatic equation  $\Delta p = \rho g \Delta z$ .

In this equation:  
 $g$  is the gravitational acceleration in m/s<sup>2</sup> ( $g = 9.81 \text{ m/s}^2$ )  
 $\rho$  is the air density in kg/m<sup>3</sup>  
 $\Delta p$  is pressure difference in Pa (pascal)  
 $\Delta z$  is the thickness of different height

When the mean air density between 1000 hPa to 500 hPa layer is 0.910 kg/m<sup>3</sup>, calculate the height of 500 hPa level with the assumption that mean sea level pressure is 1000 hPa  
(show your calculations). (3 pts)

Answer: 1 hPa = 100 Pa = 100 kg/m/s<sup>2</sup>

$$\Delta p = 1000 \text{ hPa} - 500 \text{ hPa} = 500 \text{ hPa} = 50000 \text{ Pa}$$

$$\begin{aligned}\Delta p = \rho g \Delta z \rightarrow \Delta z &= \Delta p / (\rho g) \\ &= 50000 \text{ Pa} / (0.910 \text{ kg/m}^3 \times 9.81 \text{ m/s}^2) \\ &= 50000 \text{ Pa} / (8.9271 \text{ kg/m}^2/\text{s}^2) \\ &= 5600,9 \text{ m}\end{aligned}$$

Thus the hight of 500 hPa level is  $\approx 5601 \text{ m}$

**IESO 2012 Written TEST Hydrosphere**

Name \_\_\_\_\_ Nationality \_\_\_\_\_

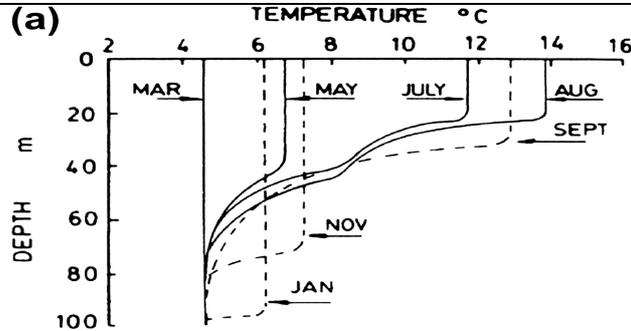


Figure 1(a) vertical temperature profiles

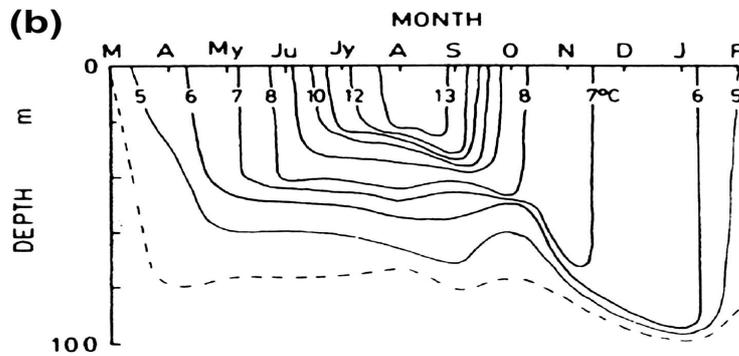


Figure 1(b) time series of isothermal contours.

1). Figures 1(a) and 1(b) show growth and decay of the seasonal thermocline at 50°N, 145°W in the eastern North Pacific. The upper mixed layer, as seen in the upper part of Figure 1(a) is a vertically mixed layer with nearly homogeneous water temperature.

Referring the above figures 1(a) and 1(b), choose two right answers (2pts).

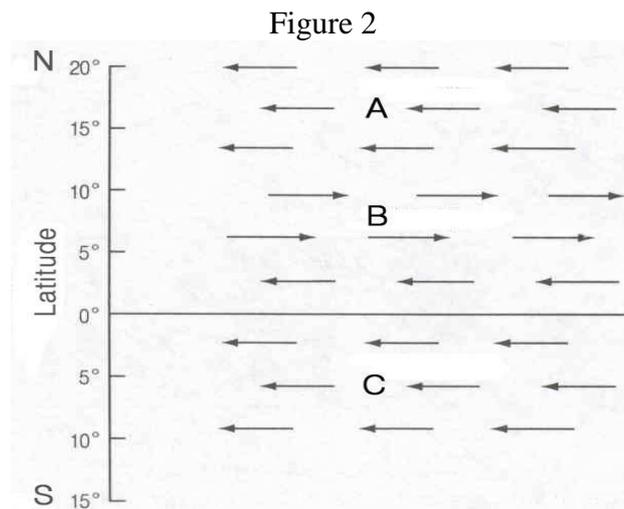
- A. Variation of the mixed layer depth depends on the strength of the warm and cold water currents.
- B. Decreasing of the mixed layer thickness from winter to summer is due to the heat increase from solar radiation and the decrease of mixing by weakening winds.
- C. The main processes that cause the highest water temperature to occur in August are due to the cold water runoff from the land and the decrease of mixed layer thickness.
- D. The depth of the mixed layer in November is deeper than in May. One of the factors causing an increase in depth of the mixed layer in November is thermal convection due to the surface cooling by heat loss.

**All the right answers are: B, D**

2). Methane hydrates, also called <i>fire ice</i> , trap methane molecules, and are found in enormous quantities in the near subsurface of marine sediments in many places. If the warming of water melts the <i>fire ice</i> , and liberates the methane molecules into the ocean water and eventually into the atmosphere, what will the effect on the global weather be: (2 pts)	Decreasing the global warming	A
	Increasing the global warming	B
	It will not affect the global warming	C
	Increasing only the local warming	D

3). Tide is the most periodic phenomena in the sea but the tidal range varies every day. Choose the two <u>INCORRECT</u> answers describing the tidal phenomena (2 pts).	Lunar tide is generated by the difference of forces between the gravitational attraction force of the Moon and the centrifugal force by the Earth's rotation.	A
	Tide generating forces (TGF) by the Sun is about 46% of TGF by the Moon.	B
	Tidal range is greater in the new and full moon phases than in quarter moon phases.	C
	Spring and neap tides are produced by the superposition of diurnal and semi-diurnal tides.	D
	High and low tides occur once or twice a day depending on the geographical locations on the Earth.	E

4). Figure 2 below indicates the general pattern of ocean currents in the Pacific Ocean.



4.1) From Figure 2, what wind is responsible for the current at location A? (2pts)

- (A) Polar Westerly Wind
- (B) Southeasterly Trade Wind
- (C) Westerly Wind
- (D) Northeasterly Trade Wind

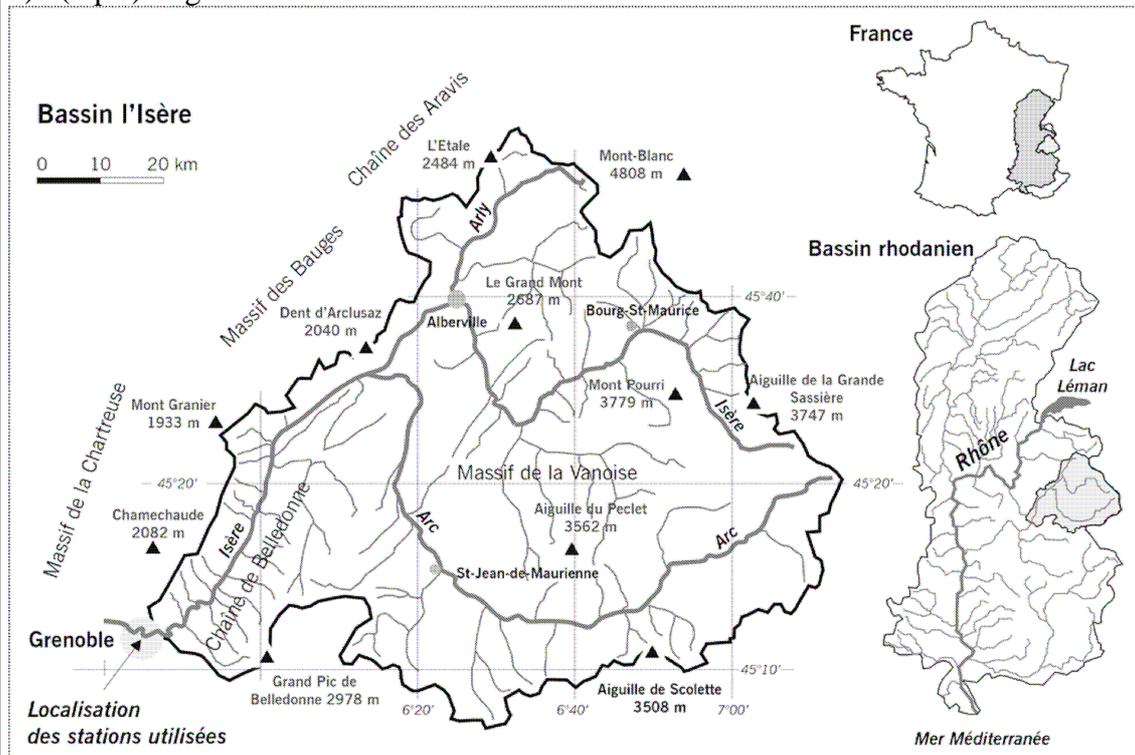
4.2) From Figure 2, what is the name of current at location B? (2pts)

- (A) South Equatorial Current
- (B) Equatorial Counter Current
- (C) North Equatorial Current
- (D) North Pacific Current

4.3) Currents at locations A, B, C all belong to the geostrophic current. What are the two major opposing forces that create the geostrophic currents? (2 pts)

- (A) Wind stress
- (B) Coriolis force
- (C) Pressure gradient force
- (D) Bottom friction

5) . (3 pts) Figure 3



The alpine river Isère, in France flows through the city of Grenoble. Its drainage basin, as measured at this location, has an area of  $6 \times 10^9 \text{ m}^2$ . The mean density of the rocks in this drainage basin is  $2.5 \text{ g/cm}^3$ . During the year 2004, the Isère at Grenoble removed  $3 \times 10^9 \text{ kg}$  of material (dissolved and solid). For the drainage basin, calculate the mean rate of erosion in depth per year for 2004. Choose the correct answer.

2 meters per year	A
1 meter per year	B
20 millimeters per year	C
2 millimeters per year	D
0.2 millimeter per year	E



**IESO 2012 Written TEST Geosphere**

Name \_\_\_\_\_ Nationality \_\_\_\_\_

Write down your answer in the separate answer sheet.

Choose ONLY one answer for every question.

All questions carry the same points

1. The existence of an inner solid core is supported by seismic signals crossing the core that have arrival _____ than (as) expected for a given seismic station.	Earlier	A
	Later	B
	Same time	C

2. Which of the following statements is most correct for transform faults?	They may have active and inactive segments	A
	They change from normal to reverse along strike	B
	They are related to mid ocean ridges	C
	A and C are correct	D

3. Isostatic models explain the presence of thick roots under most mountain chains. These roots depend on _____.	The average rock density in the mountain chain	A
	The height of the mountain chain	B
	Neither A or B	C
	Both A and B.	D

4. Polygonal patterns are found in several geological structures. Choose all polygonal patterns. a) Columnar jointing in igneous rocks b) Mud cracks c) Polygonal soils d) Recrystallization of some minerals during metamorphism	a,b	A
	b,d	B
	a,b,c	C
	a,b,c,d	D

5. Each mineral has a typical colour of its powder (streak). Choose the correct combination of mineral name and the colour of its powder.	Hematite, red; Azurite: blue; Malachite: green; Kaolin: white; Goethite: ochre (orange); Magnetite: black.	A
	Hematite, red; Azurite: blue; Malachite: green; Kaolin: ochre (orange); Goethite: white; Magnetite: black.	B
	Hematite: black; Azurite: blue; Malachite: green; Kaolin: white; Goethite: red; Magnetite: ochre (orange).	C
	Hematite, red; Azurite: blue; Malachite: green; Kaolin: ochre (orange); Goethite: black; Magnetite: white.	D

6. Stromatolites are _____:	Related to the first stages of plate tectonic development on the Earth	A
	Related to the activity of cyanobacteria (blue-green algae)	B
	Fossil marine plants indicative of warm and clear shallow waters developing during interglacial periods	C
	Related to the activity of bacteria	D

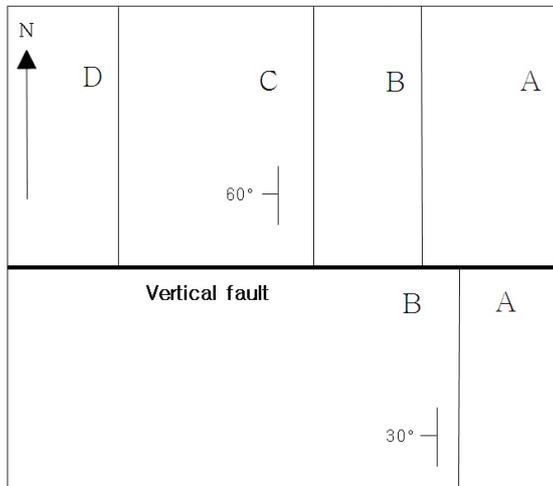
7. Gravitational acceleration is recorded at points A and B of the same elevation. Assuming a homogeneous subsurface structure and similar density, which point (A or B) will show a larger gravitational acceleration?



A

B

8. Which type of fault could have displaced the traces of contact between northern and southern blocks? Notice that the dip of the layers changes from the northern to the southern block and that you have evidence that it is not a strike slip fault.



Left-lateral strike-slip fault

A

Reverse fault

B

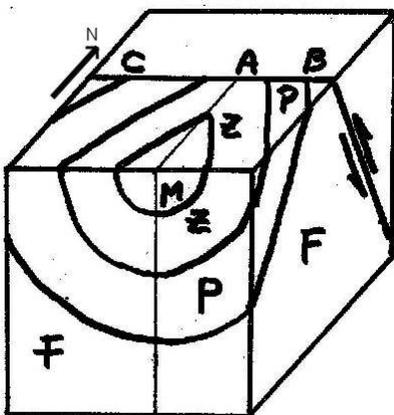
Normal fault

C

A rotational or oblique slip fault

D

9. M, Z and P are sedimentary beds that have been affected by a reverse fault. Will the boundaries between the sedimentary beds be closer or farther apart in the northern block.



Closer to each other

A

Further away

B

No change

C

Move to the left

D

<p>10. A “doodle” that celebrated the 374<sup>th</sup> anniversary of Steno appeared on January 11 of this year. Steno did a great job trying to find out how many natural processes worked. He is considered the father of Geology because he established several principles that worked as keystones for the further developments of the geological knowledge.</p> <p>The Google logo makes reference to the most famous of his principles that refers to the order of layers in a normal sedimentary sequence. Can you name the principle and whether or not exceptions to the principle could exist.</p>  <p>Reference: <a href="http://www.google.com/Nicolas-Steno-374th-birthday">www.google.com/Nicolas-Steno-374th-birthday</a></p>	The law of Faunal Succession, no exception	A
	Law of Superposition, no exception	B
	Principle of Superposition, there are exceptions	C
	The law of Faunal Succession, there are exceptions	D

11. Crinoids are a group of:	algae	A
	bivalves	B
	corals	C
	echinoderms	D

12. A granite pluton intrudes a sedimentary succession composed of limestone and sandstone. Which kind of metamorphic rocks will be formed?	marble and quartzite	A
	schist and marble	B
	schist and gneiss	C
	quartzite and gneiss	D

13. Which of the following pairs of minerals cannot be found in the same rock type?	olivine – pyroxene	A
	olivine -quartz	B
	biotite – quartz	C
	plagioclase – pyroxene	D

<p>14. Which of the following phenomena are precursors of an impending (forthcoming) volcanic eruption?</p> <p>a) Floods</p> <p>b) Anomalous seismicity</p> <p>c) Heavy rains</p> <p>d) Increase of temperature and chemical changes in fumarolic gases</p> <p>e) Strong winds</p> <p>g) Ground uplift</p>	a,b,d	A
	b,d,g	B
	b	C
	all	D

<p>15. What is this geological phenomenon called that has occurred in a karst region?</p> 	volcanic chimney	A
	meteor impact crater	B
	rockfalls	C
	sinkhole	D

<p>16. What kind of a fault caused the displacement of this fence?</p> 	Dextral (right lateral) strike-slip fault	A
	Sinistral (left lateral) strike-slip fault	B
	oblique slip fault	C
	thrust fault	D

<p>17. Choose the sedimentary feature which DOES NOT increase with distance from the source area of sediments.</p> <p>1. grain size 2. roundness 3. quartz to feldspar ratio</p>	1	A
	2	B
	3	C
	2 and 3	D

<p>18. The precipitation of which of the following minerals is regulated by the concentration of CO<sub>2</sub> in the solution?</p>	halite;	A
	gypsum;	B
	apatite;	C
	calcite;	D

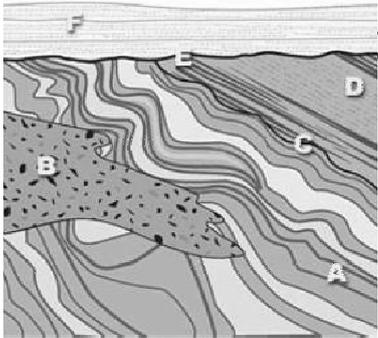
<p>19. In which of the following geological contexts is it more probable to find oil reservoirs?</p>	Deep ocean trench	A
	Abyssal plains	B
	Mid - oceanic ridges	C
	Passive continental margin	D

20. Comparing two materials with different viscosities, the one with the higher viscosity....:	flows easier	A
	<b>is harder to deform</b>	B
	is easier to deform	C
	is less sticky	D

21. Which of the following provide evidence of plate tectonic activity?	the rotation of Earth	A
	<b>the presence of mid-ocean ridge</b>	B
	the presence of impact crater	C
	the presence of erosion	D

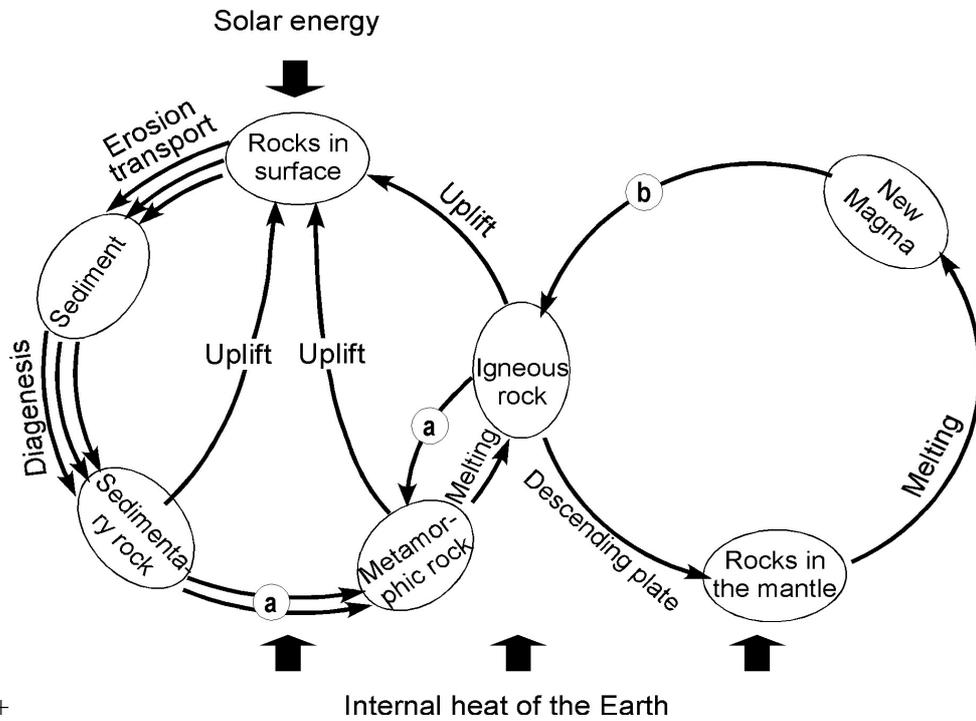
22. The photo below displays cross-bedding. Where is the youngest strata shown on this vertical outcrop? 	<b>top</b>	A
	bottom	B
	top right	C
	bottom left	D

23. There are three rocks A, B, and C. Two of them are basalt and limestone. If the formation temperature T of the three rocks are $T_A > T_B > T_C$ , which statement is correct?	A is limestone	A
	<b>B is schist</b>	B
	B is evaporite	C
	C is basalt	D

	24. Which of the geological features can not be determined in this geological section for its relative age sequence? There is no overturning of beds.	A
		B
		C
		D
		E
		F

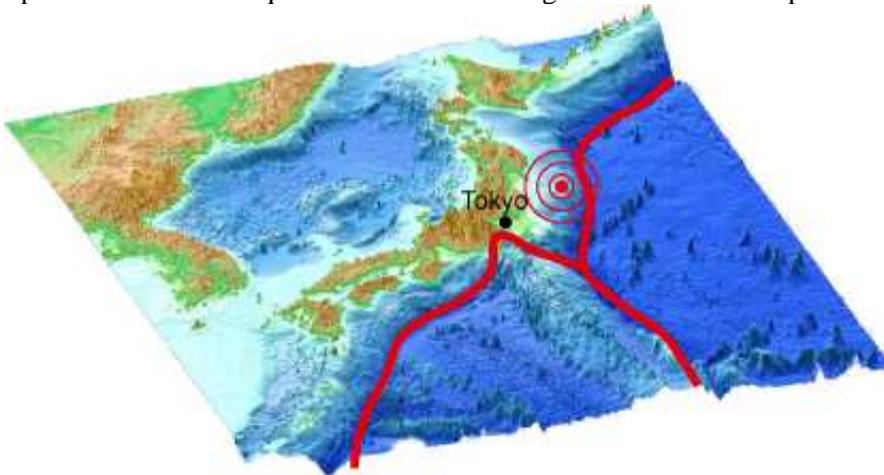
25. Choose ALL sedimentary structures useful in paleocurrent analysis. 1. graded bedding, 2. cross bedding, 3. desiccation cracks, 4. ripple marks	1,2	A
	1,3	B
	3,4	C
	2,4	D

This is a schematic diagram showing rock cycle in lithosphere. Rocks at the Earth's surface change due to various geological processes.



26. What is the name of the process represented by (a) in the diagram above?	solidification	A
	metamorphism	B
	transport	C
	earthquake	D

A great earthquake M 9.0 occurred off the Pacific of Tohoku in Japan on March 11, 2011. The epicenter of the earthquake is shown in the figure. The red line is plate boundary.



Divergent-normal	A
Convergent-strik slip	B

	Convergent-reverse	C
	Convergent-normal	D

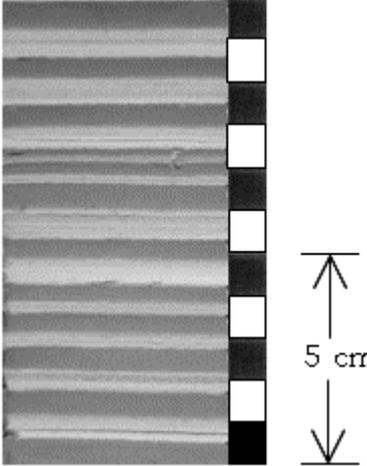
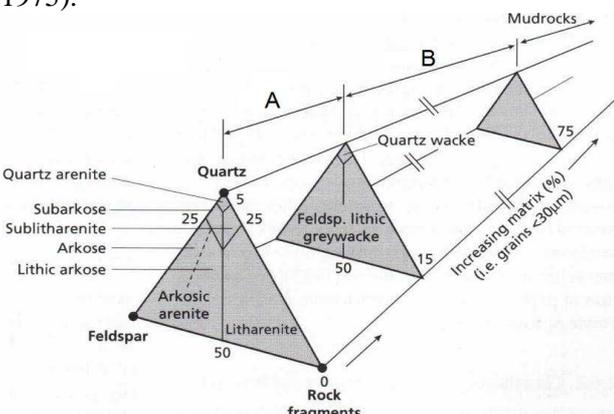
	The following diagram shows a sedimentary sequence obtained from a lake. Answer the questions.		
	28. Explain the formation of light and dark layers in terms of water circulation.	a,b	A
	a) The light layer was deposited during the time of good water circulation and organic matter was oxidized	a,c	B
	b) The dark layer was deposited during the time of good water circulation and organic matter was oxidized	b,d	C
	c) The dark layer was deposited during the time of poor water circulation and organic matter was not oxidized.	c,d	D
d) The light layer was deposited during the time of poor water circulation and organic matter was not oxidized.			
30. Which layer(s) do you think show coarse grains? (1.pts)	Light layer	A	
	Dark layer	B	
	Both	C	
	Neither	D	

Figure shows the classification of sandstones by Pettijohn (1975).	30. Show the names of rocks A and B in the figure.	Quartz arenite-mudrock	A
		Mudrock-greywacke	B
		Arenite-wacke	C
		Greywacke-quartz arenite	D

31. Earth's bulk density is $5500 \text{ kg/m}^3$ . It is estimated that Earth's uncompressed density (the density Earth would have if gravity were "turned off" and pressure inside the Earth were zero) is $4000 \text{ kg/m}^3$ . Using the actual mass of Earth ( $6.0 \times 10^{24} \text{ kg}$ ), what would its radius have to be to give a bulk density of $4000 \text{ kg/m}^3$ ? (Assume this Earth is a perfect sphere.)	2500 km	A
	14200 km	B
	3050 km	C
	7100 km	D

32. How can studies of ice cores help scientists to understand and predict future climate changes?	The record of frequencies-amplitudes of cyclic climate changes can serve to predict major cycles;	A
	The physical record can be correlated with changes in atmospheric gases and aerosols;	B

	The physical record can be correlated to changes in mean ocean and atmospheric temperatures,	C
	The physical record can be correlated to changes in ocean salinity, glacial intervals, etc.	D
	All of the above answers	E