Multiple Choice with Written Option

This is an assessment technique that I have been using in an introductory astronomy class for non-science majors. This differs from traditional multiple choice exams in two ways. First, the students answer each question three times. If they are confident with their answer then they will select that answer three times on the answer sheet. However, if they are unsure between two answers then they can select both, putting more weight on the one in which they have more confidence by selecting it twice and once for their less confident answer.

The second difference with traditional multiple choice is option (e). This option allows the student the opportunity to write their own answer on the back of the answer sheet. Below are some examples questions I have used where students have opted for their own answer.

A lunar eclipse can occur during a ___ .

a. 1st quarter moon b. full moon
c. 3rd quarter moon d. new moon
e. Provide your own written answer on the back of the answer sheet.

For the question above my goal was to determine if the students understood the geometrical relationship between the Sun, Moon and Earth during a lunar eclipse. While the correct answer is (b), one student drew the correct configuration of a lunar eclipse identifying the Sun, Moon and Earth. I gave the student full credit for their answer because they correctly demonstrated a lunar eclipse.

According to Newton's third law, all forces act __ .

a. in the same direction b. in pairs
c. at right angles d. only on objects moving in straight lines
e. Provide your own written answer on the back of the answer sheet.

For this question the correct answer is (b). One written answer I received was the statement that for all forces there is an equal by opposite force. I did not use this terminology in class but it is a description of Newton's third law that is used quite often. Clearly the student understood the question but not *my* answer, and therefore the written option gave them the opportunity to demonstrate that understanding.

On the following pages is a sample quiz. Students fill in three lines on the answer sheet for each question and if they select option (e) they write their answer on the back of the answer sheet.

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Answer each question three times. Be sure that you are filling in the correct numbers on the answer sheet. Answers A through D are worth 1 point each for 3 points total per question. If you select answer E for any question then you must provide your written answer on the back of the test sheet (be sure to number your answers). If you select E then you must select it for all three questions. Your written answer for E will be worth up to 3 points.

[1-3] The distance from the Earth to the Sun is

a. 1 astronomical unit
b. 1 light year
c. 1000 meters
d. 1000 fathoms
e. Provide your own written answer on the back of the answer sheet.

[4-6] A first quarter moon rises at ___ .

a. midnight
b. sunrise
c. noon
d. sunset
e. Provide your own written answer on the back of the answer sheet.

[7-9] An object that is moving due west will be ___ .

a. increasing in Right Ascension
b. decreasing in Right Ascension
c. increasing in Declination
d. decreasing in Declination
e. Provide your own written answer on the back of the answer sheet.

[10-12] You observe Mars next to a certain star on one night. If Mars is moving in a retrograde fashion, one week later it will be generally ___ of the same star.

a. north
b. south
c. east
d. west
e. Provide your own written answer on the back of the answer sheet.

[13-15] Kepler's first law of planetary motion states that the planets move in ___ orbits around the Sun, with the Sun at ___ of the ___ .

a. elliptical, the center, ellipse
b. elliptical, one focus, ellipse
c. circular, the center, circle
d. circular, one focus, circle
e. Provide your own written answer on the back of the answer sheet.

[16-18] You are standing outside General Studies building and observer a star to be at the zenith. At the same instant, an observer at the same latitude, but further west, will see the same star ___ .

a. north of the zenith
b. south of the zenith
c. east of the zenith
d. west of the zenith
e. Provide your own written answer on the back of the answer sheet.

[19-21] An example of a constellation is ___ , while ___ is an asterism.

a. the Big Dipper, the Little Dipper
b. The Little Dipper, Orion
c. Polaris, the North Star
d. Ursa Major, the Big Dipper
e. Provide your own written answer on the back of the answer sheet.

[22-24] If Venus is at its greatest elongation west of the sun, then it would be called the ___ .

a. North star
b. Morning star
c. Midnight star
d. Evening Star
e. Provide your own written answer on the back of the answer sheet.

[25-27] If Jupiter was in opposition with the Earth it would be directly above the south horizon at ___ .

a. midnight
b. sunrise
c. noon
d. sunset
e. Provide your own written answer on the back of the answer sheet.

[28-30] The nine planets that orbit the Sun are (closest to the Sun first);

a. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto
b. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Neptune, Uranus, Pluto
c. Mercury, Mars, Earth, Venus, Saturn, Jupiter, Uranus, Pluto, Neptune
d. Venus, Mars, Earth, Mercury, Jupiter, Saturn, Pluto, Neptune, Uranus
e. Provide your own written answer on the back of the answer sheet.