SPH4U1 Review – Fields – GEM Name:

Instructions: Please leave your final answers in the answer boxes for each section.

1.	What is the direction of the net force on a satellite moving in a circular orbit around Earth? (6.1) K/U (a) tangentially, in the same direction as the satellite's motion (b) radially inward, toward the centre of Earth (c) radially outward, away from the centre of Earth (d) tangentially, in the opposite direction to the satellite's motion	2.	If the distance between two point masses is doubled, the gravitational attraction between them (a) is doubled (b) is increased by a factor of four (c) is reduced to half (d) is reduced to a quarter (6.1) K/U
3.	Why do satellites orbit Earth and not crash down to Earth's surface? (6.2) K/U (a) There is no gravity above Earth's atmosphere. (b) The satellite has the necessary orbital velocity to keep it orbiting Earth. (c) The gravitational pull of the Moon and other planets on the satellite is just the right amount to keep it from falling into Earth. (d) All of the above are true.	4.	A solid copper sphere is given an electric charge. How does the charge distribute itself across the copper sphere? (7.1) K/U (a) All the charge is concentrated in the centre of the sphere. (b) The charge is most concentrated in the centre and becomes less concentrated at the outer surface. (c) All the charge sinks to the lower half of the sphere. (d) All the charge is distributed around the outer surface of the sphere.
5.	What fundamental force is responsible for keeping electrons attracted to their host nucleus in an atom? (7.2) K/U (a) the gravitational force (b) the electric force (c) the magnetic force (d) the strong nuclear force	6.	Particle A has positive charge $+q$ and is fixed in place. Particle B has negative charge $-q$ and is fixed in place 0.5 m directly north of particle A. Determine the direction in which the electric field points midway on the line connecting the two particles. (7.3) K/U (a) north (b) east (c) west (d) south
7.	A charged particle enters a magnetic field with a speed v and experiences a force of magnitude F. Determine the force on the charged particle if it enters the same magnetic field in the same direction, but with a speed $3v$. (8.2) K/U (a) F (b) $3F$ (c) $9F$ (d) $18F$	8.	Two parallel current-carrying wires will attract each other magnetically (a) if the currents run in the same direction (b) if the currents run in the opposite direction (c) if the currents have the same magnitude (d) never (8.3) K/U T/I

Multiple Choice - Answers

1.	2.	3.	4.	5.	6.	7.	8.

Short Answer Questions (do your work on a separate sheet, place your final answers in the question boxes)

1.	An observational satellite is designed to orbit Mars at an altitude of 5.2×10^5 m. Mars has a mass of 6.4×10^{23} kg and an average radius of 3.4×10^6 m. Calculate the necessary orbital velocity of the satellite, and its orbital period in minutes. (6.2) T/I	2.	The electrostatic force on a small sphere of charge 0.6 μC due to another small sphere of charge −0.8 μC has magnitude 0.2 N. (7.2) T/I (a) Calculate the distance between the two spheres. (b) Identify the nature of the force on the second sphere due to the first.
3.	A proton is moving through a magnetic field. (8.2) K/U T/I A (a) When does the proton experience a maximum magnetic force? (b) When does the proton experience a minimum magnetic force?	4.	A long, straight wire carries a current of $I = 125$ A in a region where the magnetic field has magnitude $B = 7.3$ T, but the force on the wire is zero. Explain how that can be. (8.3) T/I
5.	An electron is released from rest in an electric field of magnitude 500 N/C. (7.3) T/I (a) Determine the magnitude of the electric force on the electron. (b) Determine the magnitude of the acceleration of the electron. (c) Determine the electron's final speed after it travels a distance of 2.5 cm.	6.	A sphere of mass 40 kg is attracted by a second sphere of mass 15 kg, when their centres are 63 cm apart, with a force of 1.0×10^{-7} N. Calculate the value of the gravitational constant. (6.1) T/I
7.	Three equal charges of 2.0×10^{-6} C each are fixed at the three corners of an equilateral triangle with side length 5.0 cm. Determine the net force experienced by one of the charges due to the other two charges. (7.3) K/U T/I A	8.	In a mass spectrometer, a beam of singly charged ions of mass 5.0×10^{-26} kg is accelerated to a final speed of 7.2×10^5 m/s. A magnetic field then steers the ions in a circle of radius 40 cm. Determine the necessary strength of the magnetic field in the mass spectrometer. (8.4) T/I

Concept Map – be sure to include all formulas you may need as NONE will be provided (kinematics, energy, circular motion, gravitational, electric, magnetic), also include all constants (G, k, q, mass of electrons, protons, Earth's properties radius, mass, etc.) – your Concept map will be handed in with your test and will be given a mark out of 10 based on thoroughness, effort, and organization.